

**YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT  
COMPLIANCE-BASED EVALUATION  
INDUSTRIAL HYGIENE PROGRAM**



**January 30, 1997**

**Office of Oversight  
Environment, Safety and Health  
U.S. Department of Energy**

**Washington, DC 20585**

**Yucca Mountain Site Characterization Project  
Compliance-Based Evaluation  
Industrial Hygiene Program  
January 6 - 17, 1997**

**Background and Purpose**

To supplement its industrial hygiene program management review of October 28 - November 1, 1996, the Department of Energy (DOE) Office of Oversight, at the request of the Yucca Mountain Site Characterization Office (YMSCO) Assistant Manager for Environment, Safety and Health (AMESH), conducted a technically oriented, compliance-based evaluation of the principal industrial hygiene program elements at the Yucca Mountain Site Characterization Project (YMP).

**Scope and Approach**

The evaluation covered the industrial hygiene programs of the YMP management and operating (M&O) contractor and the M&O construction subcontractor (Kiewit/PB) at the Exploratory Studies Facility (ESF), including ESF pad areas and M&O-Kiewit/PB leased office buildings. Activities evaluated centered around tunnel construction and its support activities, as well as certain offsite activities such as training.

The principal objective was to provide a compliance baseline for selected YMP industrial hygiene program elements. The methodology employed included:

- Determining the applicable regulations to evaluate the industrial hygiene programs against, including Occupational Safety and Health Administration (OSHA) regulations, DOE orders, American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit values (TLVs), and American National Standards Institute (ANSI) and other industry-accepted standards.
- Determining how the program is documented, including the program plan (especially if required by OSHA), procedures, and field plans.
- Determining the status of compliance with the regulatory basis through interviews, document reviews, and observations of workplace activities.

This approach was applied to each of the following areas:

- Hazard Communication
- Respiratory Protection
- Occupational Noise
- Heat Stress
- Confined Space Entry
- Ergonomics
- Record Keeping/Reporting
- Indoor Air Quality/Smoking Policy.

## **Compliance Assessment Summary**

### **Hazard Communication**

While their programs meet basic OSHA requirements, both M&O and Kiewit/PB written hazard communication (HAZCOM) program documents have room for improvement in meeting OSHA's intent for written programs. Employee HAZCOM training does not address how to recognize hazardous chemical releases.

### **Respiratory Protection**

Both the M&O and Kiewit/PB respiratory protection programs comply substantially with OSHA requirements. However, proper storage practices were not always used, and written procedures for respirator selection were not available.

### **Occupational Noise**

Both the M&O and Kiewit/PB occupational noise programs address the fundamental elements of an occupational noise program. However, there are opportunities for improvement. Heavy equipment operators and miners on the ESF pad are not sufficiently protected from high noise levels, and non-compliances in Kiewit/PB procedures and industrial hygiene field practices were observed.

### **Heat Stress**

The Kiewit/PB heat stress program has a balanced approach that includes identification of potentially hazardous activities, the evaluation of those activities with up-to-date measurement techniques, and control of heat stress-related hazards through a strong program of engineering controls.

### **Confined Space Entry**

Elements of a limited confined space entry program are being implemented on the ESF pad. Kiewit/PB provisions for such entries only partially comply with the ANSI Standard Z117.1 for Safety Requirements for Confined Spaces. Non-compliances were observed with respect to the lack or inconsistency in posting of confined spaces, lack of documentation of confined spaces and hazards, and lack of rescue and retrieval capabilities. Non-compliances were also observed in the Kiewit/PB confined space training; the Kiewit/PB Safety and Health Plan; and industrial hygiene practice in the field.

### **Ergonomics**

Only the M&O has implemented an ergonomics program for its workers. Kiewit/PB's limited ergonomic activities consist of (1) inclusion of ergonomics in the "General Office Safety" training provided to all non-construction workers; and (2) monthly office walkthroughs conducted by representatives of the Kiewit/PB Safety and Environment, Safety and Health (ES&H) Training Groups. The M&O has implemented an effective ergonomic program that mitigates "office ergonomic" hazards. However, the program is not documented and lacks procedures.

**Recordkeeping/Reporting**

Kiewit/PB maintains all OSHA-required records and sends Computerized Accident and Incident Reporting System reports directly to DOE as required. Instances of recordability determinations did not agree with OSHA guidance.

**Indoor Air Quality/Smoking Policy**

Only the M&O has implemented an indoor air quality program for its office and warehouse workers and a no-smoking policy, which is described in the M&O's Safety and Health Plan. The M&O indoor air quality program is effective, although not well documented. Indoor air quality program demands are infrequent, and the M&O Industrial Hygiene Group has been responsive to those demands.

**Conclusion**

YMP has made significant progress in developing its industrial hygiene programs. While some significant shortcomings were observed and non-compliances were found, a large majority of the team's observations were positive and the team's findings indicated compliance with applicable regulations.

**YUCCA MOUNTAIN PROJECT  
INDUSTRIAL HYGIENE PROGRAM COMPLIANCE REVIEW**

**PROGRAM ELEMENT ASSESSED:**

Hazard Communication (HAZCOM)

**REGULATORY BASIS:**

29 CFR 1910.1200 (General Industry) and 29 CFR 1926.59 (Construction), as applicable. Also, OSHA Instruction CPL 2-2.38C, OCT 22, 1990, "Inspection Procedures for the Hazard Communication Standard, ...," was used as a basis for specifically reviewing written HAZCOM program elements.

**PERSONNEL CONTACTED:**

Rudy Johnson, Kiewit/PB, Environmental Spec.

Paul Nowka, Kiewit/PB, Mine Rescue Team

Mary Lou Brown, Kiewit/PB, Training

Mike Penovich, M&O, Training

Mike Pochowski, M&O, Industrial Hygiene

**COMPLIANCE ASSESSMENT SUMMARY**

A regulatory compliance assessment of the HAZCOM programs of both the M&O contractor and the construction subcontractor (Kiewit/PB) as implemented in the ESF tunnel and pad areas, was conducted. While there is some independence between the M&O and Kiewit/PB HAZCOM training activities, the chemical inventory and Material Safety Data Sheet (MSDS) files are wholly included in the M&O inventory and MSDS system. Hazardous chemical materials brought onsite by independent laboratory personnel are reviewed and approved by both the M&O and Kiewit/PB. The M&O has oversight responsibility for the Kiewit/PB HAZCOM program.

While their programs meet basic OSHA requirements, both M&O and Kiewit/PB written HAZCOM program documents have room for improvement in meeting OSHA's intent for written programs. Employee HAZCOM training does not address how to recognize hazardous chemical releases.

The content of MSDSs, a manufacturer responsibility, was not reviewed.

**YUCCA MOUNTAIN PROJECT  
INDUSTRIAL HYGIENE PROGRAM COMPLIANCE REVIEW (Continued)**

**OBSERVATIONS OF PROFICIENCIES AND DEFICIENCIES**

**Proficiencies**

The compiling, cross-referencing, updating, and controlled distribution of MSDSs is a strong point.

**Non-compliances**

Summarized in Table 1, following.

**Recommendations**

Much of the M&O and Kiewit/PB written programs is a restatement of OSHA requirements. These documents will more closely meet OSHA's intent if they are rewritten to explain how, in terms specific to YMP and the ESF site, the actual programs meet OSHA's requirements for labeling, MSDSs, and employee training.

**Table 1. Hazard Communication (HAZCOM)**  
(NC = Non-compliance, C = Compliance, NA = Not Applicable)

Lines of Inquiry	Status	Comment
<p><b>Criterion 1: A written Hazard Communication Program has been developed, and implemented at the workplace. [29 CFR 1910.1200 (e) (1); 29 CFR 1926.59 (e) (1)]</b></p>	<p align="center">NC</p>	<p>The M&amp;O contractor's written HAZCOM Program is contained in Procedure NAP-SH-003 [Rev. 1, 7/16/96] "Compliance with the Occupational Safety and Health Administration Hazard Communication Standard. The M&amp;O program, as written, addresses each of the topic areas required by OSHA. <b>In some cases, the program document does not address <u>how</u> the requirement will be met. The following items, from OSHA's Instruction to their Compliance Officers, need to be addressed in the M&amp;O written program:</b></p> <ul style="list-style-type: none"> <li>- Description of written alternatives to labeling of in-plant containers, where applicable.</li> <li>- Procedures to review and update label information when necessary.</li> <li>- Format of the training program to be used (audiovisuals, classroom instruction, etc.).</li> <li>- Elements of the training program as required by 29 CFR 1910.1200, paragraph (h).</li> <li>- Procedures to train employees of new hazards they may be exposed to when working on or near another employer's worksite (i.e., hazards introduced by other employees).</li> <li>- The methods used to inform subcontractors of the labeling system used.</li> <li>- Written program availability to employees and their designated representatives.</li> </ul>



**Table 1. Hazard Communication (HAZCOM) (continued)**  
(NC = Non-compliance, C = Compliance, NA = Not Applicable)

Lines of Inquiry	Status	Comment
Criterion 1 (Continued)	NC	<p>The Kiewit/PB written HAZCOM program is currently contained in Appendix 1 [Rev. 2, 3/11/96] to the Kiewit/PB Yucca Mountain Site Characterization Project Safety and Health Plan of July 1996. The Kiewit/PB program, as written, addresses each of the topic areas required by OSHA. <b>In some cases, particularly with respect to labeling, the program document does not address <u>how</u> the requirement will be met. The following items, from OSHA's Instruction to their Compliance Officers, need to be addressed in the Kiewit/PB written program:</b></p> <ul style="list-style-type: none"> <li>- A description of the labeling system(s) used.</li> <li>- Description of written alternatives to labeling of in-plant containers, where applicable.</li> <li>- Procedures to review and update label information when necessary.</li> <li>- How employees can access MSDSs.</li> <li>- Designation of person(s) responsible for conducting training.</li> <li>- Format of the program to be used (audiovisuals, classroom instruction, etc.).</li> <li>- How subcontractors on site will be informed of the labeling system in place.</li> </ul>
<b>In addition to labeling, MSDSs, and employee training, the program includes:</b>		
LOI 1a: A list of hazardous chemicals present. [29 CFR 1910.1200(e)(1)(i); 29 CFR 1926.59(e)(1)(i)]	C	<p>The M&amp;O contractor maintains a program-wide list of hazardous chemicals, and Kiewit/PB maintains a list, covering most of the ESF, which is included in the M&amp;O list. Supervisors are required to update the lists for their areas semiannually. Between 500 and 600 chemicals or chemical formulations exist on site. Many of these are end-user products such as lubricants and cleaning agents. A list of these items is kept by Kiewit/PB on a computerized database that is cross-indexed by name, chemical classification (local system) and number (local). Copies of these lists are kept with each MSDS Manual. Maintenance of the Kiewit/PB database is prescribed in "Regulated Materials Management Plan," YMP 81-38.</p>
LOI 1b: Methods used to inform employees of the hazards of non-routine tasks. [29 CFR 1910.1200 (e)(1)(ii); 29 CFR 1926.59(e)(1)(ii)]	C	<p>Employees are informed of the hazards involved with non-routine tasks through their supervisors and through the Job Safety Analysis (JSA) system. JSAs are part of the work packages for non-routine work.</p>

**Table 1. Hazard Communication (HAZCOM) (continued)**  
(NC = Non-compliance, C = Compliance, NA = Not Applicable)

Lines of Inquiry	Status	Comment
LOI 1c: Methods used to provide subcontractor employees access to MSDS. [29 CFR 1910.1200(e)(2)(i); 29 CFR 1926.59(e)(2)(i)]	C	Kiewit/PB employees are provided direct access to MSDSs and are directly informed of needed precautionary measures since their organization manages the HAZCOM program itself. Other subcontractor employees, such as scientific investigators, must provide for Kiewit/PB approval, MSDS for any chemicals they bring on site.
LOI 1d: Methods used to inform subcontractor of needed precautionary measures during their work. [29 CFR 1910.1200(e)(2)(ii); 29 CFR 1926.59(e)(2)(ii)]	C	Subcontractor employees are informed of the hazards involved with their tasks through their supervisors and through the JSA system. JSAs are part of the work packages for non-routine work.
LOI 1e: Methods used to inform subcontractor of labeling system in place. [29 CFR 1910.1200(e)(2)(iii); 29 CFR 1926.59(e)(2)(iii)]	NC	The M&O has adopted the National Fire Protection Association (NFPA) (diamond) labeling system. Kiewit/PB uses the Hazardous Materials Identification System (HMIS). Labels on chemicals from outside are maintained as-received. <b>Neither HAZCOM program addresses how third-party subcontractors are to be informed of these, or possibly other, labeling systems.</b>
Criterion 2. Chemical containers are properly labeled.		
LOI 2a: Chemical manufacturers' labels contain:  - identity of hazardous chemical - appropriate hazard warnings - manufacturer's address.  [29 CFR 1910.1200(f)(1)(i-iii); 29 CFR 1926.59(f)(1)(i-iii)]	C	Labels used at the YMP site are either manufacturer-supplied and conform to OSHA requirements for content, or they conform to the HMIS, if applied locally. Labeling is prescribed in Technical Control Procedure (TCP) 3.0, "Control of Regulated Materials."
LOI 2b: Each container of hazardous chemicals in the workplace is labeled with:  - identity of hazardous chemical - appropriate hazard warnings  [29 CFR 1910.1200(f)(5)(i-ii); 29 CFR 1926.59(f)(5)(i-ii)]	C	See LOI 2a.
LOI 2c: Labels are legible and not defaced. [29 CFR 1910.1200(f)(8-9); 29 CFR 1926.59(f)(8-9)]	C	A limited walkthrough review revealed no instances of illegible, defaced, or missing chemical container labels.

**Table 1. Hazard Communication (HAZCOM) (continued)**  
(NC = Non-compliance, C = Compliance, NA = Not Applicable)

Lines of Inquiry	Status	Comment
Criterion 3. Material safety data sheets (MSDS) for each hazardous chemical are available in the workplace.		
<p>LOI 3a: Each MSDS contains the minimal information required by OSHA, including:</p> <ul style="list-style-type: none"> <li>- identity (from label)</li> <li>- name (chem/common)</li> <li>- ingredients</li> <li>- phys/chem characteristics</li> <li>- physical hazards</li> <li>- health hazards</li> <li>- exposure route(s)</li> <li>- OSHA PEL/ACGIH TLV</li> <li>- NTP carcinogen des.</li> <li>- safe handling, incl. cleanup</li> <li>- controls, incl. PPE</li> <li>- first aid</li> <li>- date</li> <li>- mfgr's. data</li> </ul> <p>[29 CFR 1910.1200(g)(2)(i-xii); 29 CFR 1926.59(g)(2)(i-xii)]</p>	NA	Not reviewed. Both the M&O and the Kiewit/PB programs assure that MSDSs will be on hand before a chemical is used. The manufacturer is responsible for completeness and accuracy.
LOI 3b: MSDSs for each hazardous chemical are maintained in the workplace and are readily accessible on each shift. [29 CFR 1910.1200(g)(8); 29 CFR 1926.59(g)(8)]	C	Files of current MSDSs are maintained at nine work and office locations in the pad area. Some, including the set at the Portal Access Building, are available on all shifts. These files are on a controlled distribution for updates (TCP 3.6, "MSDS Manual Update").
Criterion 4. Employees are provided training on the hazardous chemicals in their work areas.		

**Table 1. Hazard Communication (HAZCOM) (continued)**  
(NC = Non-compliance, C = Compliance, NA = Not Applicable)

Lines of Inquiry	Status	Comment
<p>LOI 4a: Effective information and training is provided:</p> <ul style="list-style-type: none"> <li>- upon initial employment</li> <li>- whenever a new hazard requiring new training is introduced into the workplace.</li> </ul> <p>[29 CFR 1910.1200(h)(1); 29 CFR 1926.59(h)(1)]</p>	C	<p>Currently, Kiewit/PB employees receive required HAZCOM training as a stand-alone module of self-instruction with examination as part of their new employee training. This general training is <u>not</u> specific to the YMP site. Site employees receive further YMP site-specific training as described below.</p>
<p>LOI 4b: Employees are informed of:</p> <ul style="list-style-type: none"> <li>- the requirements of the HAZCOM standard</li> <li>- workplace operations involving hazardous chemicals</li> <li>- location of written program, chemical lists and MSDSs</li> </ul> <p>[29 CFR 1910.1200(h)(2); 29 CFR 1926.59(h)(2)]</p>	C	<p>Employees who work at the construction site receive an additional 1-1/2 hours of HAZCOM training (Kiewit/PB No. ESH0001-0), which describes the requirements of the construction industry HAZCOM standard (29 CFR 1926.59) and workplace operations that could involve hazardous chemicals.</p>
<p>LOI 4c: Employee training includes:</p> <ul style="list-style-type: none"> <li>- how to detect releases</li> <li>- physical and health hazards</li> <li>- protective measures that can be taken</li> <li>- program details including labeling and MSDS use.</li> </ul> <p>[29 CFR 1910.1200(g)(3); 29 CFR 1926.59(g)(3)]</p>	NC	<p>Site-specific HAZCOM training includes physical and health hazards and possible protective measures in general terms, and details on labeling systems and MSDS use. <b>However, this training does not cover how to detect releases using the senses (odor, irritation, etc.) or simple instrumentation.</b></p>

**YUCCA MOUNTAIN PROJECT  
INDUSTRIAL HYGIENE PROGRAM COMPLIANCE REVIEW**

**PROGRAM ELEMENT ASSESSED:**

Respiratory Protection

**REGULATORY BASIS:**

29 CFR 1910.134 and 29 CFR 1926.103 apply to General Industry and Construction, respectively.

**PERSONNEL CONTACTED:**

Bob Law, M&O, Construction Management Organization (CMO)

Barry McNeill, Kiewit/PB, Industrial Hygiene

Marty Rajsich, Kiewit/PB, Welder

Dan Chapman, M&O, Industrial Hygiene

Paul Nowka, Kiewit/PB, Mine Rescue Team

Mary Lou Brown, Kiewit/PB, Training

Mike Penovich, M&O, Training

Mike Pochowski, M&O, Industrial Hygiene

**COMPLIANCE ASSESSMENT SUMMARY**

A regulatory compliance assessment of the respiratory protection programs of both the M&O contractor and the construction subcontractor (Kiewit/PB), as implemented in the ESF tunnel and pad areas, was conducted. Training and respirator fitting functions are performed separately by M&O and Kiewit/PB. Respirator cleaning, maintenance, and inspection functions are performed by Kiewit/PB for both organizations at YMP.

Both M&O and Kiewit/PB respiratory protection programs comply substantially with OSHA requirements. However, proper storage practices were not always used, and written procedures for respirator selection were not available.

The medical program to determine the physical qualifications of respirator users was not reviewed.

<p style="text-align: center;"><b>YUCCA MOUNTAIN PROJECT</b> <b>INDUSTRIAL HYGIENE PROGRAM COMPLIANCE REVIEW (Continued)</b></p>
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<p style="text-align: center;"><b>OBSERVATIONS OF PROFICIENCIES AND DEFICIENCIES</b></p>
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<p style="text-align: center;"><b>Proficiencies</b></p>
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<p>Respirator cleaning, inspection, and maintenance are outstanding and form a model operation.</p>
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<p style="text-align: center;"><b>Non-compliances</b></p>
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<p>Summarized in Table 2, following.</p>
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<p style="text-align: center;"><b>Recommendations</b></p>
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<p>None.</p>
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**Table 2. Respiratory Protection**  
(NC = Non-compliance, C = Compliance, NA = Not Applicable)

Lines of Inquiry	Status	Comment
Criterion 1. Respiratory protection is provided to employees in accordance with OSHA permissible practices.		
LOI 1a: Prevention of atmospheric contaminants is accomplished as far as feasible by engineering measures. [29 CFR 1910.134(a)(1); 29 CFR 1926.103(d)(1)]	C	Section 3.3.1 of the Kiewit/PB program document (see below) provides that respiratory protection can be used "only when engineering controls and administrative controls are not feasible ... ." The team's walkthroughs of work areas found that extensive engineering controls have been implemented and that respirators continue to be used only in those areas where engineering controls are not feasible. Other possible areas for applying engineering controls, such as remote control of some machinery, are being reviewed.
LOI 1b: A respiratory protection program has been established and maintained. [29 CFR 1910.134(a)(2); 29 CFR 1926.103(d)(2)]	C	The M&O's written respiratory protection program is contained in Procedure NAP-SH-009 (Rev. 0, 8/29/96), "Respiratory Protection."  The Kiewit/PB written respiratory protection program document is contained as Appendix 3 (Rev. 3, 1/7/97) to the Kiewit/PB Yucca Mountain Site Characterization Safety and Health Plan, July 1996.
LOI 1c: Employees use the respiratory protection provided them. [29 CFR 1910.134(a)(3); 29 CFR 1926.103(d)(3)]	C	Workplace walkthroughs found that employees used the respiratory protection assigned to them.
Criterion 2. The Respiratory Protection Program contains the following elements:		
LOI 2a: - written SOPs for selection and use [29 CFR 1910.134(b)(1); 29 CFR 1926.103(e)(1)]	NC	<b>Written standard operating procedures detailing the steps for, and logic behind, respirator selection were not available, either for the M&amp;O contractor or for Kiewit/PB.</b> The team was informed that selection of the reusable/disposable respirators was based on the logic contained in ANSI Z88.2-19_, in an expert-based exercise.
LOI 2b: - selection on basis of hazards [29 CFR 1910.134(b)(2); 29 CFR 1926.103(e)(2)]	C	Observations of various work operations and the respirators being used for them indicate that respirators are chosen on the basis of hazards.
LOI 2c: - user instruction and training [29 CFR 1910.134(b)(3); 29 CFR 1926.103(e)(3)]	C	Both Kiewit/PB and the M&O have user instruction and training programs that also include fit testing.

**Table 2. Respiratory Protection (continued)**  
(NC = Non-compliance, C = Compliance, NA = Not Applicable)

Lines of Inquiry	Status	Comment
LOI 2d: - cleaning and disinfection [29 CFR 1910.134(b)(5); 29 CFR 1926.103(e)(5)]	C	Kiewit/PB has an excellent respirator cleaning, disinfection, and maintenance program and facilities, which serve both the M&O and the construction subcontractor. Most non-disposable respirators are turned in daily for cleaning and disinfection. Certain individuals, e.g., the welder, may retain their respirators for more than one day, in which case the individual is trained in cleaning and disinfection procedures.
LOI 2e: - proper storage [29 CFR 1910.134(b)(6); 29 CFR 1926.103(e)(6)]	NC	<b>Two cases of apparent improper storage were observed. Both involved powered, air-purifying respirators (PAPRs). One PAPR was stored on an open crib for heavy tools in Alcove 5, exposed to dusts and impacts (although the facepiece was bagged). Another PAPR, turned in for cleaning and maintenance, had large grit particles wedged inside between the clear lens and the facepiece, indicating that it had been left lying out in the open.</b>
LOI 2f: - inspection, repair [29 CFR 1910.134(b)(7); 29 CFR 1926.103(e)(7)]	C	Inspections and repairs are done at the same facility as cleaning and maintenance by trained and experienced personnel. The facility is well equipped and stocked.
LOI 2g: - exposure surveillance [29 CFR 1910.134(b)(8); 29 CFR 1926.103(e)(8)]	C	Extensive personal exposure measurements have been taken by both M&O and Kiewit/PB to assure the appropriateness of the respiratory protection assigned.
LOI 2h: - program evaluation [29 CFR 1910.134(b)(9); 29 CFR 1926.103(e)(9)]	NC	<b>Neither the M&amp;O nor the Kiewit/PB respiratory protection program has provision for regular evaluation of program effectiveness. Attachment I to the Kiewit/PB program document is a compliance checklist for managers and supervisors.</b>
LOI 2i: - users physically qualified [29 CFR 1910.134(b)(10); 29 CFR 1926.103(e)(10)]	C	All respirator users are determined to be physically qualified for respirator use. Medical examination may range from a questionnaire to a full physical exam, depending upon circumstances. Both the M&O and the Kiewit/PB programs reference ANSI Z88.6 concerning physical qualifications for personnel. The medical program was not looked at. The M&O maintains a database of qualified respirator wearers and when they are due for annual fit tests and/or physical exams.
LOI 2j: - approved respirators [29 CFR 1910.134(b)(11); 29 CFR 1926.103(e)(11)]	C	Only National Institute of Occupational Safety and Health (NIOSH)-approved respirators were being used.
<b>Criterion 3. Proper respirators are selected, considering the following factors:</b> [29 CFR 1910.134(c); 29 CFR 1926.103(b); ANSI Z88.2-1969, 1980, and 1992]		
LOI 3a: - NIOSH/MSHA approval	C	See LOI 2j, above.



**Table 2. Respiratory Protection (continued)**  
(NC = Non-compliance, C = Compliance, NA = Not Applicable)

Lines of Inquiry	Status	Comment
LOI 3b: - nature of the hazard	C	See LOI 2b, above.
LOI 3c: - extent of the hazard	C	See LOI 2b and 2g, above.
LOI 3d: - work requirements and conditions	C	YMP has an ongoing evaluation program, involving air sampling by both M&O and Kiewit/PB to detect changing conditions that would affect respirator requirements, e.g., clear zones in the tunnel.
LOI 3e: - respirator limitations	NC	<p><b>Attachment II to the Kiewit/PB respiratory protection program, drawn from 29 CFR 1926.103, Table E-4, is out of date. Currently practice does not permit the use of a hose mask and blower in any kind of oxygen deficient- or other immediately-dangerous-to-life-and-health (IDLH) atmosphere.</b></p> <p><b>Self-contained breathing apparatus and certain airline respirators (e.g., with escape bottles) must be further specified to operate in the pressure-demand or other positive pressure mode in order to be used in IDLH atmospheres.</b></p> <p><b>The note at the bottom of this table should read: "... poses an immediate threat to life and health, or an immediate threat of severe exposure to contaminants ...". The underlined wording, present in 29 CFR 1926.103, is missing from Kiewit/PB's Attachment II to their respiratory protection program.</b></p>
LOI 3f: - employee acceptance and fit	C	Employee acceptance and fit are found to be well accommodated in the respiratory protection programs at YMP.
Criterion 4. Standard procedures cover all aspects of respirator use, under routine and possible emergency conditions.		
LOI 4a: Procedures provide the guidance necessary for proper selection, use and care. [29 CFR 1910.134(e)(1); 29 CFR 1926.103(g)(1)]	NC	Procedures for use and care are adequate. <b>Currently, respirator selection procedures are not established or written.</b> (See LOI 2a, above.)
LOI 4b: The correct respirator is specified for each job; the correct respirator is issued for each job. [29 CFR 1910.134(e)(2); 29 CFR 1926.103(g)(2)]	C	Correct respirators have been specified by Industrial Hygiene. Employees, who are trained, are responsible for selecting the correct respirator before they start work.

**Table 2. Respiratory Protection (continued)**  
(NC = Non-compliance, C = Compliance, NA = Not Applicable)

Lines of Inquiry	Status	Comment
LOI 4c: Written procedures cover the safe use of respirators in dangerous atmospheres, under normal operations or emergencies. [29 CFR 1910.134(e)(3); 29 CFR 1926.103(g)(3)]	NA	Not assessed.
LOI 4d: Frequent random inspections by a qualified individual assure respirators are properly selected, used, cleaned and maintained. [29 CFR 1910.134(e)(4); 29 CFR 1926.103(g)(4)]	C	Industrial Hygiene reviews workplaces and cleaning/repair facilities.
LOI 4e: Users (employees and supervisors) are properly instructed in respirator selection, use and maintenance. [29 CFR 1910.134(e)(5); 29 CFR 1926.103(g)(5)]	C	With the possible exception of proper storage, instruction received by the team plus field observations indicate that training in respirator selection, use, and maintenance is adequate.
LOI 4f: - Each user has received respirator fitting instructions and uses them each time the respirator is worn. [29 CFR 1910.134(e)(5)(i); 29 CFR 1926.103(g)(5)(i)]	C	Each user receives fitting instructions. <b>However, for the current reusable/disposable respirators issued for the tunnel, it is not possible (or practical) to do a negative pressure test without removing the filters.</b>
<b>Criterion 5. Respirators are covered by a complete program of care, maintenance and inspection.</b>		
LOI 5a: The program includes:		
- inspection for defects [29 CFR 1910.134(f)(1)(i); 29 CFR 1926.103(h)(1)(i)]	C	Based on inspection of facilities and interview of personnel, the care, maintenance and inspection program exceeds all requirements and is a model program.
- cleaning and disinfecting [29 CFR 1910.134(f)(1)(ii); 29 CFR 1926.103(h)(1)(ii)]	C	
- repair [29 CFR 1910.134(f)(1)(iii); 29 CFR 1926.103(h)(1)(iii)]	C	
- storage [29 CFR 1910.134(f)(1)(iv); 29 CFR 1926.103(h)(1)(iv)]	C	

**Table 2. Respiratory Protection (continued)**  
(NC = Non-compliance, C = Compliance, NA = Not Applicable)

Lines of Inquiry	Status	Comment
<p>LOI 5b: All respirators are inspected routinely, before and after each use. [29 CFR 1910.134(f)(2)(i); 29 CFR 1926.103(h)(2)(i)]</p> <p>- Respirators for emergency use are inspected after each use and at least monthly. [29 CFR 1910.134(f)(2)(i); 29 CFR 1926.103(h)(2)(i)]</p> <p>- Self-contained breathing apparatus are inspected monthly. [29 CFR 1910.134(f)(2)(ii); 29 CFR 1926.103(h)(2)(ii)]</p> <p>- A record is kept of emergency respirator inspections. [29 CFR 1910.134(f)(2)(iv); 29 CFR 1926.103(h)(2)(iv)]</p>	<p>C</p> <p>C</p> <p>C</p> <p>C</p>	<p>With the exception of the reusable/disposable respirators (above), all respirators are inspected before and after each use. This <u>includes</u> the Draeger rebreather packs used by the Mine Rescue Team, an operation that takes about ten minutes per respirator. In addition, the Draeger units are inspected monthly, and full records of these inspections were readily available.</p>
LOI 5c: Respirators are collected, cleaned and disinfected as frequently as necessary to protect the wearer. [(f)(3)]	C	Most are turned in daily. See above.
LOI 5d: Repairs are made only by qualified persons and are limited to manufacturers' instructions. [29 CFR 1910.134(f)(4); 29 CFR 1926.103(h)(4)]	C	Repairs are made by an individual who is fully qualified, trained (by the manufacturers), and experienced to make such repairs.
LOI 5e: Respirators are stored properly to protect them from damaging conditions or atmospheres. Emergency use respirators are easily accessible. [29 CFR 1910.134(f)(5); 29 CFR 1926.103(h)(5)]	C	<p>Respirators at the cleaning and repair facility are stored properly. However, storage of some respirators in other areas is less than adequate.</p> <p>No emergency use respirators are posted outside the Mine Rescue Facility. They are always under the control of the Mine Rescue Team.</p>

**YUCCA MOUNTAIN PROJECT  
INDUSTRIAL HYGIENE PROGRAM COMPLIANCE REVIEW**

**PROGRAM ELEMENT ASSESSED:**

Occupational Noise

**REGULATORY BASIS:**

A compliance review of the occupational noise program for both the M&O and the construction subcontractor (Kiewit/PB) was performed with respect to compliance to 29 CFR 1926.52, 29 CFR 1926.101, DOE 440.1 for the construction subcontractor (Kiewit/PB) and 29 CFR 1910.95 and DOE 440.1 for the M&O. The ACGIH TLVs for noise are imposed through DOE 440.1, and therefore are applicable to both. Both the M&O and Kiewit/PB are also expected to comply with their respective safety and health Plans and the YMP Safety and Health Plan.

**PERSONNEL CONTACTED:**

Barry McNeil, Jim Foley, Dan Mills, Kiewit/PB Industrial Hygiene  
Mary Lou Brown, Kiewit/PB Training  
Mike Penovich, Paul Turner, Joel Karasik, M&O Training  
Mike Pochowski, Dan Chapman, M&O Industrial Hygiene  
Mike Taylor, M&O (LANL) Industrial Hygiene  
Bill Burke, John Cole, YMSCO

**COMPLIANCE ASSESSMENT SUMMARY**

A regulatory compliance review of the occupational noise program for both the M&O and construction subcontractor was performed, encompassing both the ESF tunnel and pad areas. Since most noise sources reside with construction activities, Kiewit/PB is responsible for protecting the greatest number of employees from the highest noise exposures. The M&O function is principally to provide oversight of the Kiewit/PB occupational noise program and provide an occupational noise program for M&O employees who frequent the construction areas, such as test scientists, test engineers, and CMO personnel.

Both the M&O and Kiewit/PB occupational noise programs address the fundamental elements of an occupational noise program, and significant progress in the ESF is evident with respect to sound level monitoring, noise dosimetry, and evaluation of noise sources for engineering controls. However, there are opportunities for improvement. Heavy equipment operators and miners on the ESF pad are not sufficiently protected from high noise levels, and there are also inconsistencies between Kiewit/PB procedures and field practices. The M&O and Kiewit/PB adhere to different noise regulations, resulting in regulatory confusion and different hearing conservation programs for the same noise hazard.

Proficiencies and recommendations are provided in Table 3. Regulatory non-compliances are identified in bold in the lines of inquiry (LOIs) that follow.

The medical aspects of the occupational noise programs were not evaluated.

**YUCCA MOUNTAIN PROJECT  
INDUSTRIAL HYGIENE PROGRAM COMPLIANCE REVIEW**

**OBSERVATIONS OF PROFICIENCIES AND DEFICIENCIES**

**Proficiencies**

Significant progress in the ESF tunnel with respect to sound level monitoring, noise dosimetry, and evaluation of noise sources for engineering controls is evident.

Kiewit/PB sound level surveys and reports, reviewed during this assessment, were thorough and well structured.

**Non-compliances**

Non-compliances with respect to the regulatory basis as stated on the previous page are indicated in bold in the "Comment" column of the LOIs that follow.

**Recommendations**

The inconsistencies both in procedures and practice among M&O and Kiewit procedures and field practices concerning the applicable regulations for noise TLVs, action levels, exchange rates, and hearing conservation program criteria should be resolved so that only one standard is applicable. (LOI 1D & Criterion 2)

Kiewit/PB should include the requirement for baseline or annual audiograms in the Kiewit/PB hearing conservation program, since such testing appears feasible, is routinely provided by Bechtel Medical (the Kiewit/PB medical provider), and most importantly enables the Kiewit/PB Health and Safety organization to distinguish any hearing degradation due to work in the ESF from that due to previous exposures. (LOI 2A, 5A, 5B, 5C)

The Kiewit/PB Employee Safety Handbook is inconsistent with the Kiewit/PB Safety and Health Plan with regard to the noise levels requiring hearing protection. The Plan should be revised. (Criterion 6)

Neither the M&O procedure on Occupational Noise (NAP-SH-004) nor the Kiewit/PB Safety and Health Plan, Appendix 5 "Hearing Conservation," adequately addresses ear protection: the type of ear protection available to employees, where to obtain it, or when double protection may be required. (LOI 6A)

Based on sound level surveys on the ESF mantrain on January 8, 1997, locomotive sound levels ranged from 99 to 103 dBA. Standard ear plugs currently issued to the locomotive drivers may be unsuitable, depending on the exposure period, and should be evaluated. (LOI 7A)

**Table 3. Occupational Noise**  
(C = Compliance, NC = Non-compliance, n/a = Not Applicable)

Lines of Inquiry	Status	Comment
<b>Criterion 1: General Requirements.[1910.95 (a)]</b>	n/a	
LOI 1A: Protection against the effects of noise exposure shall be provided when the sound levels exceed those shown in Table D-2 of this section when measured on the A-scale of a standard sound level meter at slow response. [1926.52 (a)]	NC	<b>Although ESF tunnel workers appear to be adequately protected against noise, Kiewit/PB heavy equipment operators outside the tunnel are not sufficiently protected in accordance with sound levels specified in 29 CFR 1926.52.</b> Based on sound surveys performed on January 8, 1997, it was estimated that heavy equipment cab operators could be exposed to noise levels in the vicinity of 90 - 95 dBA if the cab windows and/or doors were open as was observed in the field. Cabs are not provided with hearing protection postings. Furthermore, heavy equipment operators, who do not enter the tunnel, are not required to receive general underground training (GUT) (in which hearing protection is discussed), nor are they routinely entered into the hearing conservation program, as described in Section 4.2.1 of the Kiewit/PB Safety and Health Plan.
LOI 1B: When employees are subjected to sound exceeding those listed in Table D-2, feasible administrative or engineering controls shall be utilized. If such controls fail to reduce sound levels within the levels of the table, personal protective equipment as required in subpart E shall be provided and used to reduce sound levels within the levels of the table. [1926.52(b)]	C	During the past year, significant efforts have been made by DOE, the M&O, and Kiewit/PB with respect to noise evaluation and the consideration of engineering controls to abate noise hazards in the ESF tunnel, although only minor modifications with respect to hearing abatement have been implemented (e.g. engine exhaust mufflers). In April 1996 the Mine Safety and Health Administration (MSHA) measured area and personnel sound levels and recommended engineering modifications. The Kiewit ventilation engineer surveyed off-the-shelf noise controls for noise sources on the construction site. Results indicated that standard controls were in place, with the exception of double mufflers for one of the jackhammers. A second MSHA visit occurred in December 1996 with additional sound level readings. Finally, in December 1996 an M&O consultant issued a report discussing possible modifications to the main vent fans and quieting the man train. Most modifications have been judged not to be cost effective. All areas of the ESF require ear plugs. Operators of the Alpine Miner and jackhammers require double protection (plug and muffs).

**Table 3. Occupational Noise (continued)**  
(C = Compliance, NC = Non-compliance, n/a = Not Applicable)

LOI 1C: If the variation in noise level involves maxima at intervals of one second or less, it is to be considered continuous. [1926.52(c)]	C	All noise within the ESF is considered to be either continuous or impact noise.
LOI 1D: Comply with American Conference of Governmental Industrial Hygienists (ACGIH), "Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices" (most recent edition), when ACGIH Threshold Limit Values (TLVs) are lower (more protective) than Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits. [DOE Order 440 Section 3(l)(1)].	NC	<p><b>Kiewit/PB is currently implementing a noise TLV of 90 dBA for an 8-hour time-weighted average (TWA) (5 dB exchange rate) as prescribed by 1926.52, Table D-2. ACGIH, however, requires a more restrictive TLV of 85 dBA for an 8-hour TWA (3 dB exchange rate).</b> A 90 dBA limit was evidenced in posting requirements at the ESF pad, and noise dosimetry alarm limits were set at 90 dBA with a 5 dB exchange rate. The difference in these limits is considerable. For example, an individual exposed to 90 dBA for 8 hours with a 90 dBA TLV and a 5 dB exchange rate would receive 100% of his/her dose in 8 hours. At 85 dBA TLV with a 5 dB exchange rate, that same individual would receive 200% of his/her dose in 8 hours. At 85 dBA TLV with a 3 dB exchange rate, the individual would receive 317% of his/her dose in an 8-hour period.</p> <p>In general, there are inconsistencies and confusion among the M&amp;O and Kiewit procedures and field practices concerning the applicable regulations for noise TLVs, action levels, exchange rates, and hearing conservation program criteria. The M&amp;O follows the general industry standards (29 CFR 1910.95), whereas Kiewit/PB follows the construction standards (29 CFR 1926.52 and 1926.101). Both 29 CFR 1910.95 and 1926.52 specify a TLV of 90 dBA for 8 hours with an exchange rate of 5 dB. However, only 29 CFR 1910.95 requires an action level of 85 dBA for entry into the hearing conservation program, monitoring, etc. DOE 440.1 implements ACGIH industrial hygiene TLVs since the ACGIH industrial hygiene TLVs are more restrictive than the CFRs, i.e. 85 dBA for 8 hours with a 3 dB exchange rate. The use of different regulations for the M&amp;O and Kiewit/PB also results in personnel receiving different noise protection when performing the same job. For example, CMO personnel working in an 88 dBA area for 8 hours would be required to be wear hearing protection and be included in a hearing conservation program, whereas the Kiewit miner working in the same area would be provided with neither. Furthermore, M&amp;O personnel working in Kiewit-controlled areas (i.e. the ESF) will not know whether they violated their procedures for hearing protection in noise areas of 85 to 90 dBA, since such areas may not be posted by the construction subcontractor. The confusion as to which noise requirements are applicable within the ESF is evident, even with noise consultants contracted by the M&amp;O. For example, a recent report by Dr. W.R. Thornton, issued on 12/27/96, is based on an erroneous assumption that "the facility (ESF) is obligated to meet the OSHA Noise Regulation 1910.95..." (pg 3 of 7 and Appendix), yet according to Kiewit/PB, only the construction standards are applicable.</p> <p>Note: Sound Power Level (SPL) (%dose) = <math>2 \exp [(SPL - TLV) / \text{exchange rate}] \times 100\%</math></p>

**Table 3. Occupational Noise (continued)**  
(C = Compliance, NC = Non-compliance, n/a = Not Applicable)

LOI 1E: All stationary equipment and/or areas in which noise levels of 85 dBA or greater are generated will be posted as "Hearing Protection Required Areas" [Section 4.3.3, Appendix 5, Kiewit/PB S&H Plan, Rev. 1]	NC	<p><b>Kiewit field practice, as observed, is to post hearing protection at 90 dBA (according to 1926.52, but not in accordance with the Kiewit/PB Safety and Health Plan (Section 4.3.3), requiring posting of areas in which noise levels equal or exceed 85 dBA.</b></p> <p>Hearing protection postings in certain areas on the ESF pad were either not properly posted in areas of personnel entry (e.g., berm area for the belt tensioning hydraulic pumps) or not posted in accordance with the 85 dBA posting requirements of the Kiewit/PB Safety and Health Plan (Section 4.3.3). Several areas near the tunnel entrance (e.g., three compressors and outside the trailer near the muck conveyer) indicated sound levels of 86 to 89 dBA on January 8, 1997, yet were not posted as hearing protection areas as required by the Kiewit/PB S&amp;H Plan.</p>
LOI 1F: Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level [1926.52 (e)]	C	It is not evident that any noise levels (continuous or impact) at the ESF either inside or outside the tunnel exceed those of the jackleg drill (i.e., 116 dBA). Jackleg drilling is performed at three locations on the tunnel boring machine (TBM): ring ejector, drilling and cleaning platform, and the conveyer belt placement. Jackleg drilling is also performed in the alcoves in conjunction with Alpine Miner operations.
LOI 1G: No exposures of an unprotected ear in excess of a C-weighted peak sound pressure level of 140 dB should be permitted. If instrumentation is not available to measure a C-weighted peak, an unweighted peak measurement below 140 dB may be used to imply that the C-weighted peak is below 140 dB.	n/a	No exposures in excess of 116 dBA are evident within the ESF (see previous LOI) or external pad areas.
<b>Criterion 2: Hearing Conservation Program. A Hearing conservation program consists of five elements - exposure monitoring, audiometric testing, hearing protection, employee training and record-keeping. 1910.95 (c) through (o).</b>	n/a	Both the M&O and Kiewit have instituted a hearing conservation program, yet in accordance with different standards. The M&O adheres to the requirements of 29 CFR 1910.95, and Kiewit/PB adheres to the construction standard of 29 CFR 1926.52. This is significant, not only with respect to the levels for implementing hearing conservation (i.e., 85 dBA for 1910.95 and 90 dBA for 1926.52), but also for defining the elements of a hearing conservation program. 1910.95 describes five elements that constitute a hearing conservation program, but 1926.52 provides no description of what constitutes "an effective hearing conservation program".



**Table 3. Occupational Noise (continued)**  
(C = Compliance, NC = Non-compliance, n/a = Not Applicable)

<p>LOI 2A: In all cases where the sound levels exceed the values shown herein (i.e. 90 dBA at 8 hours), a continuing, effective hearing conservation program shall be administered [ 1926.52 (d)(1)]</p>	<p align="center">NC</p>	<p><b>Heavy equipment operators outside the ESF tunnel are not routinely included in the hearing conservation program, as described in Section 4.2.1 of the Kiewit/PB Safety and Health Plan.</b> Specifically absent are monitoring of employee noise exposures, instigation of administrative controls for excessive noise, providing individuals with fitted hearing protectors, training and education, and procedures for preventing further occupational hearing losses.</p> <p>29 CFR 1926.52 does not define what constitutes an "effective hearing conservation program." However, Kiewit/PB, in response to ES&amp;H Assessment FY96C of the M&amp;O Industrial Hygiene Program (9/26/96 letter), references a seven-point program as defined by OSHA. Kiewit/PB has committed to such measures with the exception of audiometric testing, which Kiewit has deemed as not feasible. The elements of the Kiewit/PB hearing conservation program are further defined in Section 4.2.1 of the Kiewit/PB Safety and Health Plan.</p> <p>Since audiometric testing is presently offered by Bechtel Medical, which services both M&amp;O and Kiewit personnel, inclusion of baseline and annual audiograms would appear to be not only feasible but essential, especially since without a baseline it would be impossible to determine if hearing degradation occurred as a result of noise exposures in the ESF or through prior employment.</p>
<p>LOI 2B: When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. Exposure to different levels should be computed according to the formula set forth in paragraph (d)(2)(ii) of this section [ 1926.52 (d)(2)(i)]</p>	<p align="center">C</p>	<p>With the introduction of integrating noise dosimeters this activity has been supplanted. Kiewit/PB is currently in possession of five noise dosimeters, which are being used to determine noise exposures of miners who work in the ESF. Noise dosimetry has been used for TBM and Alpine Miners. A report summarizing the results is expected to be issued by Kiewit/PB before 1/17/97.</p>
<p><b>Criterion 3: Monitoring Program.</b> When information indicates that any employee's exposure may equal or exceed an 8 hour time weighted average of 85 dBA, the employer shall develop and implement a monitoring program [1910.95 (d)]</p>	<p align="center">C</p>	<p>Both the M&amp;O and Kiewit/PB have instituted monitoring programs when sound levels have exceeded their respective requirements, i.e. 85 dBA and 90 dBA.</p> <p>Kiewit/PB programs were only recently initiated due to limited noise dosimetry, and priorities were given to air sampling activities.</p>

**Table 3. Occupational Noise (continued)**  
(C = Compliance, NC = Non-compliance, n/a = Not Applicable)

LOI 3A: The sampling strategy shall be designed to identify employees for inclusion in the hearing conservation program and to enable the proper selection of hearing protectors. [1910.95(d)(i)]	C	<p>The Kiewit/PB noise sampling strategy has been to (1) define those areas (ESF and pad) in excess of 90 dBA and quantify through area readings or octave band analysis, as necessary; (2) determine exposures for groups working within those areas; and (3) assess adequacy or improvements in hearing protection and/or engineering controls.</p> <p>Since the M&amp;O provides an oversight function with respect to the Kiewit/PB occupational noise program, the M&amp;O strategy follows that of the construction subcontractor.</p>
LOI 3B: Personal sampling shall be used where circumstances such as high worker mobility, significant variations in sound level, or components of impulse noise make area monitoring inappropriate. [1910.95 (d)(ii)]	C	See the previous LOI 2B.
LOI 3C: Continuous, intermittent and impulsive sound levels from 80 to 130 decibels shall be integrated into noise instruments. [1910.95 (d)(2)(i)]	n/a	This LOI was not evaluated.
LOI 3D: Instruments used to measure employee noise exposure shall be calibrated.[1910.95 (d)(2)(ii)]	C	The Quest Sound Level Meter (Model 2400, Type 2) and the Quest Q-300 Noise Dosimeter used at the ESF by Kiewit/PB are calibrated annually at the Quest factory and before each use in the field via a field calibration unit. The sound level meter used during the review team's visit to the ESF on January 8, 1997, was found to be in calibration, and had been field calibrated that day.
LOI 3E: Monitoring shall be repeated whenever a change in production, process or equipment or controls increases noise exposures [1910.95 (d)(3)]	C	The scheduling of sound levels surveys (1) follows the daily schedule of events, unless precluded by other industrial hygiene activities (i.e. dust sampling); (2) is performed in response to employee concerns (e.g., M&O surveys performed in the wake of an electrician's concern about loud sirens at the ESF); or (3) is performed based on a pre-designated schedule by Industrial Hygiene.

**Table 3. Occupational Noise (continued)**  
(C = Compliance, NC = Non-compliance, n/a = Not Applicable)

LOI 3F: Perform periodic resurveys and/or exposure monitoring as appropriate. [DOE 440.1 Attach 1, 5.c]	C	<p>Periodic resurveys and/or sound level exposure monitoring is being performed by Kiewit/PB on a regular basis.</p> <p>The review team recorded the following sound levels within the ESF tunnel on January 8, 1997: Sound levels of 99-103 dBA were observed on the man train. TBM recorded sound levels were 95 dBA at Deck 4, 97 - 99.5 dBA at the main filter on Deck 4; 97.6 dBA at the fan inlet on Deck 2; 103 dBA near the clean room air intake filters; 82 dBA in the center of the clean room; and 90 dBA in the clean room near the fresh air inlet. (Note: The TBM was not operating). Sound levels at Alcove 5 varied from 93 dBA at the entry and 10 ft. below the fan, to 74 dBA at the bottom of the alcove. The Alcove 5 office area sound levels were 70 dBA. Sound levels measured 10 ft. from the operating Alpine Miner cab ranged from 98 to 102 dBA. Most areas of the tunnel centerline measured 84 to 85 dBA.</p>
<b>Criterion 4: Employee notification and observation of monitoring.</b> [1910.95 (e),(f)]	n/a	
LOI 4A: Each employee exposed at or above an 8-hour TWA of 85 dBA shall be notified of the results of the monitoring [1910.95 (e)]	C	For the M&O, exposure monitoring is provided to the employee by interoffice memorandum. For Kiewit/PB, 1926.52 does not require employee notification. However, practice is to post sound level and noise dosimetry monitoring results at the ESF tunnel entrance.
LOI 4B: Employer shall provide the affected employees with an opportunity to observe and noise measurements. [1910.95 (f)]	C	Based on field observation on January 8, 1997, Kiewit/PB Industrial Hygiene is interactive with the workers and would permit workers to observe sound level measurements. Likewise, the M&O provides employees an opportunity to observe monitoring. (See LOI 3E)
<b>Criterion 5: Audiometric Testing Program</b> [1910.95 (g)]	n/a	

**Table 3. Occupational Noise (continued)**  
(C = Compliance, NC = Non-compliance, n/a = Not Applicable)

<p>LOI 5A: Employer shall establish and maintain an audiometric testing program to all employees whose exposures exceed an 8 -hour TWA of 85 dBA.[1910.95 (g)(1)]</p>	<p align="center">C</p>	<p>The M&amp;O currently provides both baseline and annual audiometric exams as an element of the annual physical provided by Bechtel Medical. Audiometric exams are required by the M&amp;O program.</p> <p>Kiewit/PB does not include audiometric exams (baseline or annual) in the Kiewit/PB hearing conservation program, since such testing, according to Kiewit/PB, is not required by 1926.52. Kiewit/PB employees receive audiometric exams only if included by the medical organization in annual physicals. Recent concerns expressed by the M&amp;O is that in an effort to reduce medical costs, the audiogram may only be provided to those requesting such, if at all.</p> <p>It should be noted that the medical aspects of the hearing conservation program were not evaluated during this review.</p>
<p>LOI 5B: Within 6 months of an employee's first exposure at or above the action level, the employer shall establish a valid baseline audiogram. Testing shall be preceded by at least 14 hours without exposure to workplace noise. [1910.95 (g)(5)]</p>	<p align="center">C</p>	<p>See LOI 5A.</p>
<p>LOI 5C: At least annually, after obtaining the baseline audiogram, a new audiogram shall be obtained for each exposed employee.[1910.95 (g)(6)]</p>	<p align="center">C</p>	<p>See LOI 5A.</p>
<p><b>Criterion 6. Hearing Protectors. Employers shall make hearing protectors available to all employees exposed to an 8-hour time weighted average of 85 dBA or greater. [1910.95 (i)]</b></p>	<p align="center">C</p>	<p>Both the M&amp;O and Kiewit/PB provide hearing protectors for their employees.</p> <p>On January 8, 1997, the review team observed sufficient quantities of hearing protectors available at the ESF tunnel entrance.</p> <p>Kiewit/PB instructional material is inconsistent with regards to the noise levels requiring hearing protection. For example, pg. 9 of the Kiewit/PB Employee Safety Book requires hearing protection when noise levels are at or above 80 dB. Section 4.3.6. requires hearing protection when the noise action level (i.e., 85 dBA) is exceeded.</p>

**Table 3. Occupational Noise (continued)**  
(C = Compliance, NC = Non-compliance, n/a = Not Applicable)

LOI 6A: Whenever it is not feasible to reduce the noise levels or duration of exposures to those specified in Table D-2, Permissible Noise Exposures, in 1926.52, ear protection devices shall be provided and used. [1926.101 (a)].	NC	<p><b>On January 8, 1997, the review team observed two construction subcontractor personnel who were without hearing protection in high noise areas ranging from 95 to 108 dBA.</b> The review team observed six workers involved in a grouting operation in which the sound levels 2 feet from the grouter were measured by the team to be 106-108 dBA. The Kiewit Industrial Hygiene organization confirmed that double protection was required for those near the grouter. Of the two individuals observed near the grouter, one had muffs (and presumably earplugs). The other individual had no hearing protection. A third individual was also observed at a greater distance (yet still above 90 dBA) with no ear protection.</p> <p>Two basic types of ear protection devices are employed at the ESF and pad: earplugs and earmuffs. Earplugs are required throughout the ESF tunnel, and double protection (ear plugs and earmuffs) is required in high noise areas (Alpine Miner, jackleg drillings, etc.)</p> <p>Neither the M&amp;O procedure on Occupational Noise (NAP-SH-004) nor the Kiewit/PB Safety and Health Plan, Appendix 5 "Hearing Conservation," adequately addresses ear protection, the type of ear protection available to employees, where to obtain it, or when double protection may be required.</p>
LOI 6B: Ear protection devices inserted in the ear shall be fitted or determined individually by competent persons. [1926.101 (b)].	NC	<b>Neither the M&amp;O nor Kiewit/PB provides individual instruction either through classroom training or at the job site to ensure the proper fitting of earplugs.</b> Excessive noise is addressed in the Kiewit/PB GUT Course SH94002. However, individual fitting of plugs is not addressed.
LOI 6C: Plain cotton is not an acceptable protective device [1926.101 (c)].	C	Plain cotton hearing protection devices were not observed at the ESF.
LOI 6D: Employees shall be given the opportunity to select their hearing protection from a variety of suitable hearing protectors. [1910.95 (i)(3)]	C	Several types of hearing protection muffs and earplugs are available for the employee. At least two types of earplugs were observed at the ESF tunnel entrance.
LOI 6E: Employer shall provide training in the use and care of hearing protectors to all employees. [1910.95 (i)(4)]	NC	<b>M&amp;O training in hearing protection, as provided to M&amp;O personnel either through GUT or hearing conservation program training, does not include instruction in the use and care of hearing protectors.</b>

**Table 3. Occupational Noise (continued)**  
(C = Compliance, NC = Non-compliance, n/a = Not Applicable)

LOI 6F: Employer shall ensure proper initial fitting and supervise the correct use of all hearing protectors. [1910.95 (i)(5)]	NC	See LOI 6B.												
<b>Criterion 7. Hearing Protector Attenuation. The employer shall evaluate hearing protection attenuation for the specific noise environments in which the protector will be used. [1910.95 (j)]</b>	n/a													
LOI 7A: Hearing protectors must attenuate employee exposure to at least an 8-hour TWA of 90 dBA.[1910.95 (j)(2)].	C	<p>Hearing protectors used at the ESF are as follows with their associated noise reduction rating (NRR) factors:</p> <table><thead><tr><th><u>Hearing Protection Device</u></th><th><u>NRR (dBA)</u></th></tr></thead><tbody><tr><td>Quiet Muff Model QM24</td><td>24</td></tr><tr><td>Bilson Hard Hat</td><td>23</td></tr><tr><td>Maxi Plugs</td><td>33</td></tr><tr><td>Quiet Muff QM</td><td>29</td></tr><tr><td>Standard Ear Plugs</td><td>29</td></tr></tbody></table> <p>Field Attenuation Factor = (NRR-7)/2 = 11 for standard plugs. Thus, any area over 90 dBA + 11 dBA, or 101 dBA, would require more protection than standard earplugs alone. Hearing protection in the ESF appears to be sufficient for the activities performed, although a review of hearing protection would be prudent.</p> <p>Of concern are the ESF locomotive drivers. Based on sound level surveys on the train on January 8, 1997, locomotive sound levels ranged from 99 to 103 dBA. Standard ear plugs currently issued to the locomotive drivers may be unsuitable, depending on the exposure period, and should be evaluated.</p>	<u>Hearing Protection Device</u>	<u>NRR (dBA)</u>	Quiet Muff Model QM24	24	Bilson Hard Hat	23	Maxi Plugs	33	Quiet Muff QM	29	Standard Ear Plugs	29
<u>Hearing Protection Device</u>	<u>NRR (dBA)</u>													
Quiet Muff Model QM24	24													
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Quiet Muff QM	29													
Standard Ear Plugs	29													

**Table 3. Occupational Noise (continued)**  
(C = Compliance, NC = Non-compliance, n/a = Not Applicable)

LOI 7B: The adequacy of hearing protection attenuation shall be re-evaluated whenever employee noise exposures increase to the extent that hearing protectors provided may no longer provide adequate protection. [1910.95 (j)(4)]	C	See LOI 7A.
<b>Criterion 8. Training Program</b>	n/a	
LOI 8A: The employer shall institute a training program for all employees who are exposed to noise at or above an 8-hour time weighted average of 85 decibels, and shall ensure employee participation in such a program. [1910.95 (k)(1)]	C	This LOI is currently applicable only to the M&O (i.e., 1910.95 requirement only). The M&O maintains a list of individuals who are potentially exposed to noise at or above an 8-hour TWA of 85 dBA. Hearing conservation training is provided for these individuals on an annual basis.
LOI 8B: The training program shall be repeated annually for each employee included in the hearing conservation program and shall include effects of noise on hearing, purpose of hearing protectors, purpose of audiometric testing, etc. [1910.95 (k)(2)]	C	This LOI is currently applicable only to the M&O (i.e., 1910.95 requirement only). The M&O hearing conservation training includes those elements listed in the OSHA standard.
<b>Criterion 9. Recordkeeping. [1910.95 (m)]</b>	n/a	
LOI 9A: The employer shall maintain an accurate record of all employee exposure measurements required by paragraph (d) of this section.[1910.95 (m)(1)]	n/a	This LOI pertains only to the M&O, who performs only a small fraction of the sound level surveys and therefore was not evaluated.

**Table 3. Occupational Noise (continued)**  
(C = Compliance, NC = Non-compliance, n/a = Not Applicable)

LOI 9B: Noise exposure measurement records shall be maintained for two years. [1910.95 (m)(3)].	n/a	See LOI 9A.
LOI 9C: All records shall be provided upon request to employees.[1910.95 (m)(4)].	n/a	See LOI 9A.



**YUCCA MOUNTAIN PROJECT  
INDUSTRIAL HYGIENE PROGRAM COMPLIANCE REVIEW**

**PROGRAM ELEMENT ASSESSED:**

Heat Stress

**REGULATORY BASIS:**

ACGIH TLVs. "Internal Audit Criteria for Industrial Hygiene Programs," DOE, unpublished, was used as a good-practice guideline. Lines of inquiry from this document were binned under the three traditional industrial hygiene criteria of identification, evaluation, and control (see Table 4).

**PERSONNEL CONTACTED:**

Jim Foley, Kiewit/PB, Industrial Hygiene  
Barry McNeill, Kiewit/PB, Industrial Hygiene  
Danny Kvam, Kiewit/PB, Industrial Hygiene  
Mary Lou Brown, Kiewit/PB, Training  
Mike Penovich, M&O, Training  
Mike Pochowski, M&O, Industrial Hygiene

**COMPLIANCE ASSESSMENT SUMMARY**

An assessment of the Kiewit/PB heat stress program as implemented in the ESF tunnel area was conducted. The program was assessed against consensus criteria reflecting the traditional industrial hygiene tenets of identification, evaluation, and control.

The Kiewit/PB heat stress program has a balanced approach including identification of potentially hazardous activities, the evaluation of those activities with up-to-date measurement techniques, and control of heat stress-related hazards through a strong program of engineering controls.

Cold stress and the medical assessment aspects of heat stress were not reviewed.

**OBSERVATIONS OF PROFICIENCIES AND DEFICIENCIES**

**Proficiencies**

Strong points of the Kiewit/PB heat stress program are the ongoing monitoring activities and the engineering control approach (i.e., ventilation) taken, especially in the ESF tunnel area.

**Non-compliances**

None.

**Recommendations**

None.

**Table 4. Heat/Cold Stress**  
(NC = Non-compliance, C = Compliance, NA = Not Applicable)

Lines of Inquiry	Status	Comment
<b>Criterion 1. There is a program which controls the risk of extreme temperature, including the use of the ACGIndustrial hygiene-TLVs or other appropriate exposure limits.</b>	C	The Kiewit/PB written heat stress program is contained in Appendix 12 [Rev. 0, 10/4/96] to the Kiewit/PB Yucca Mountain Site Characterization Project Safety and Health Plan of July 1996. The M&O has a written program in draft.
LOI 1a: Written program incorporating ACGIndustrial hygiene criteria for exposure and work-rest regimens.	C	The Kiewit/PB program provides that the supervisor, in coordination with the Industrial Hygiene Supervisor, will evaluate conditions and make the final determination on work-rest regimens. The AGCIH criteria are not specifically referred to. Historically, there has not been occasion to use work-rest regimens.
LOI 1b: Primacy is given to engineering controls	C	Walkthroughs of tunnel work areas showed several engineering measures taken to reduce heat stress, including spot ventilation of work areas and fabrication of the Clean Room (break area) on the TBM. The Kiewit/PB program document, however, does not contain a statement of primacy of engineering controls.
LOI 1c: Medical assessments given to individuals who work in hot environments.	N/A	Not covered in Kiewit/PB program. Kiewit/PB staff currently have complete annual physical exams. This may change with funding cutbacks.
LOI 1d: Training programs for affected workers.	C	Heat stress is covered in Kiewit/PB new hire training, General Employee Training (GET), General Underground Training (GUT), in the First Aid/CPR course for all site employees, and in respirator training. Content includes factors leading to heat stress, symptoms to recognize, and treatments for heat stress cases.
LOI 1e: Provisions made for recordkeeping.	C	Records of heat stress measurements taken are kept by Kiewit/PB Industrial Hygiene.
<b>Criterion 2. All hot environments are identified by area and/or by process, and these areas have been posted as such.</b>	C	All hot environments in the tunnel have been identified by process. They are not posted as such.

**Table 4. Heat/Cold Stress (continued)**  
(NC = Non-compliance, C = Compliance, NA = Not Applicable)

<b>Criterion 3. The identified hot environments have been evaluated for their degree of risk to workers.</b>		
LOI 3a: All identified hot environments have been surveyed and receive periodic surveillance for changes in condition.	C	Hot environments in the tunnel are monitored on a regular basis for changes in condition.
LOI 3b: Proper, calibrated instrumentation is used to measure heat stress conditions.	C	Proper, pre- and post-calibrated instrumentation is used. All monitoring instrumentation is returned to its manufacturer for annual maintenance.
<b>Criterion 4. Based on evaluations, controls have been installed to prevent adverse effects to workers.</b>		
LOI 4a: Engineering controls are used wherever feasible. These include:  <ul style="list-style-type: none"> <li>- general ventilation or spot cooling</li> <li>- local exhaust ventilation of spot heat sources</li> <li>- radiant heat shields and insulation</li> <li>- dehumidification</li> <li>- other</li> </ul>	C	General ventilation and spot cooling are the primary means to reduce heat stress conditions in the tunnel. Dehumidification, while needed, is not feasible.

**Table 4. Heat/Cold Stress (continued)**  
(NC = Non-compliance, C = Compliance, NA = Not Applicable)

LOI 4b: Administrative measures are used:  - scheduling to cooler times of day - mechanization of work - specialized work clothing	C	Outside construction activities are scheduled to end shortly after mid-day before heat builds up.
LOI 4c: Temperature sensors and displays in each identified hot environment.	N/A	
LOI 4d: Work in hot environments is performed under the observation of a trained individual.	C	Work is observed by Industrial Hygiene personnel who cover all shifts in the tunnel.
LOI 4e: Workers are allowed a sufficient acclimatization period before entering the hot environment.	C	The standard two-week acclimatization period is stressed in training and practice.
LOI 4f: Cool-down or rest areas are provided in the immediate area.	C	A ventilated, clean-room rest area is provided for workers on the TBM.

**YUCCA MOUNTAIN PROJECT  
INDUSTRIAL HYGIENE PROGRAM COMPLIANCE REVIEW**

**PROGRAM ELEMENT ASSESSED:**

Confined Space Entry

**REGULATORY BASIS:**

A compliance review of elements of the construction confined space entry program was performed with respect to compliance to 29 CFR 1926.21, DOE Order 440.1, and ANSI Z117.1-1989 "American National Standard Safety Requirements for Confined Spaces." ANSI Z117.1 has been considered as a compliance standard for this review, since (1) OSHA cites the ANSI Z117.1 for construction activities through the OSHA General Duty Clause 5(1)(a); (2) the Kiewit/PB confined space entry and training program (procedure and training) are based on this ANSI Standard, and (3) OSHA does not reference the General Industrial Confined Space Standard 1910.146 as applicable to construction work activities. Both the M&O and Kiewit/PB are also expected to comply with their respective Safety and Health Plans and the YMP Safety and Health Plan. This presents a regulatory conflict since Section 3.3.4.5 of the YMP Safety and Health Plan requires that confined space entry be in accordance with 29 CFR 1910.146.

**PERSONNEL CONTACTED:**

Barry McNeil, Dan Mills, Kiewit/PB Industrial Hygiene  
Greg Dan, Kiewit/PB Pipefitter  
Mary Lou Brown, Kiewit/PB Training  
Mike Penovich, Paul Turner, Joel Karasik, M&O Training  
Mike Pochowski, Dan Chapman, M&O Industrial Hygiene  
Bill Burke, John Cole, YMSCO

**COMPLIANCE ASSESSMENT SUMMARY**

The primary responsibility for the confined space program at YMP resides with Kiewit/PB, since the vast majority (if not all) of the identified confined spaces reside within construction areas that have yet to be turned over to the M&O. Of the estimated 50 confined spaces, most are sewer, water, or electrical manholes. Other ESF confined spaces include fuel and water tanks, crawl spaces, pits and vaults, silos at the batch plant and agitator cars. No confined spaces were evident within the tunnel, and the tunnel itself has not been classified as a confined space. The M&O does not currently have a confined space entry program.

Elements of a limited confined space entry program for confined spaces for atmospheric testing (CSATs) are being implemented on the ESF pad. Although non-permitted and permit-required confined space entries (NPCSs and PRCSSs) are infrequent, Kiewit/PB provisions for such entries only partially comply with the ANSI Standard. Of concern is the lack of or inconsistency in posting of confined spaces, lack of documentation of confined spaces and hazards, and minimal rescue and retrieval capabilities. Discrepancies in documentation were also observed between the Kiewit/PB confined space training (which is based on ANSI Z117.1); the Kiewit/PB S&H Plan (which in July 1996 deleted any reference to the ANSI Standard); and industrial hygiene practice in the field. Several of the deficiencies noted herein (e.g., postings, rescue) are the responsibility of Kiewit/PB line management and not Kiewit/PB Safety and Health, according to Section 4.2 of Appendix 6 of the Kiewit/PB Safety and Health Plan.

The medical and psychological aspects of confined space entries were not evaluated.

**YUCCA MOUNTAIN PROJECT  
INDUSTRIAL HYGIENE PROGRAM COMPLIANCE REVIEW (Continued)**

**OBSERVATIONS OF PROFICIENCIES AND DEFICIENCIES**

**Proficiencies**

No confined space compliance deficiencies with respect to 29 CFR 1926.21 were identified during this review.

The Kiewit/PB Industrial Hygiene Manager is knowledgeable of confined space entry practices and procedures.

Kiewit/PB training programs for confined spaces are thorough, well documented, and provided to those who require such training.

**Non-compliances**

Non-compliances with respect to the regulatory basis as stated on the previous page are indicated in bold in the "Comment" column in Table 5.

**Recommendations**

YMSCO, the M&O, and Kiewit/PB should reach a consensus as to the most appropriate regulations upon which to base the YMP confined space entry programs and modify their Safety and Health Plans accordingly. Most confined spaces are located at the ESF and are within the responsibility of the construction subcontractor. However, these confined spaces are associated with process systems no longer under construction. Therefore, 29 CFR 1910.146 may be the most appropriate standard. (Criterion 1)

The M&O has not developed a confined space entry program, training, or rescue capability. Since an estimated 14 of the 27 ESF systems, including those with confined spaces, are scheduled to be turned over from construction to the M&O during 1997, consideration should be given to the development of such a program. (Criterion 1)

The Kiewit/PB Safety and Health Plan and training allows for confined spaces to be classified as either PRCs or NPCs. However, the Kiewit/PB Industrial Hygiene Group has identified a third classification of confined spaces, namely CSATs, which is not addressed in either in the Kiewit/PB Safety and Health Plan or in the Kiewit/PB confined space training. (LOI 1D)

The calibration frequency of the multi-gas meter, used in testing confined space atmospheres, is indicated in the manufacturer's manual and on the calibration data sheet as being required daily. However industrial hygiene field practice is to calibrate the instrument less frequently. Neither the identification nor the justification of less frequent calibration intervals is documented.

**Table 5. Confined Space Entry**  
( C = Compliance, NC = Non-compliance, n/a = Not Applicable)

Lines of Inquiry	Status	Comment
<b>General</b>		
For the purpose of paragraph (b)(6)(i) of this section, "confined space" means any space having a limited means of egress, which is subject to the accumulation of toxic or flammable contaminants or has oxygen deficient atmosphere. Confined or enclosed spaces include, but are not limited to, storage tank, process vessels, bins, boilers, ventilation or exhaust ducts, sewers, underground utility vaults, tunnels, pipelines, and open top spaces more than 4 ft. in depth such as pits, tubs vaults and vessels. [29 CFR 1926.21(6)(ii)]	n/a	<p>It is estimated that more than 50 confined spaces exist at the ESF, external to the tunnel, including sewer, electrical, and water manholes, fuel and water tanks, crawl spaces, pits and vaults, silos at the batch plant, and agitator cars. No confined spaces were evident within the tunnel, and the tunnel itself has not been classified as a confined space.</p> <p>Presently, most entries are associated with water manholes either for gauge reading or valve manipulation. Sufficient forethought during the design of these systems could have removed the gauges and valve operators to preclude this hazard.</p>
<b>Criterion 1: Identification and Evaluation.</b>  Confined space entry shall be in accordance with the requirements of 29 CFR 1910.146. [YMP Safety and Health Plan, Rev. 3, Section 3.3.4.5.]	NC	<p><b>Neither the M&amp;O nor Kiewit/PB has established confined space entry programs in accordance with 29 CFR 1910.146.</b></p> <p>The primary responsibility for the confined space program at YMP resides with Kiewit/PB, since the vast majority (if not all) of the identified confined spaces reside within construction areas that have yet to be turned over to the M&amp;O. The M&amp;O does not currently have a confined space entry program.</p>
LOI 1A: A survey shall be conducted of the premises, or operations, or both to identify confined spaces as defined in this standard.[ANSI Z117.1, Para 3.1]	NC	<p><b>A formal inventory of those locations or equipment that meet the definition of a confined space per the ANSI Standard has not been performed.</b></p> <p>The Kiewit/PB Industrial Hygiene Supervisor is aware of the confined spaces within the ESF, yet the locations and hazards associated with ESF confined spaces have not been documented.</p>

**Table 5. Confined Space Entry (continued)**  
(C = Compliance, NC = Non-compliance, n/a = Not Applicable)

<p>LOI 1B: Hazards shall be identified for each confined space to include the past and current uses of the confined space; the physical characteristics, configuration and location of the confined space; existing or potential hazards in the confined space; biological hazards associated with the confined space; and mechanical hazards [ANSI Z117.1, Para 3.2]</p>	<p align="center">NC</p>	<p><b>Hazards associated with each confined space or groups of confined spaces of similar function have yet to be documented in accordance with the ANSI Standard.</b> However, 90% of those confined spaces that are routinely entered are associated with water lines, for which the potential hazards are oxygen deficiencies, engulfment through an inadvertent opening of a water valve, poisonous snakes, or spiders. Electrical hazards, oxygen deficiencies, poisonous snakes, and spiders are present with entries associated with electrical manholes. Methane and hydrogen sulfide may be present in sewers.</p>
<p>LOI 1C: Hazards identified shall be evaluated by a qualified person. Each hazard shall be examined with respect to the scope of the hazard exposure; magnitude of the hazard; likelihood of hazard occurrence, consequence of hazard occurrence, potential for changing conditions, strategies for controlling the hazards, and impact on the need for emergency response. [ANSI Z117.1, Para 3.3]</p>	<p align="center">NC</p>	<p><b>A detailed and documented evaluation of confined spaces and hazards has not been performed by Kiewit/PB,</b> although Kiewit/PB Industrial Hygiene appears to have an understanding of potential hazards associated with each type of confined space within the ESF pad areas.</p>
<p>LOI 1D: Based on the evaluation of the hazards, a qualified person shall classify the confined space as either a permit-required confined space (PRCS) or a non-permit required confined space (NPCS). [ANSI Z117.1, Para 3.4]</p>	<p align="center">C</p>	<p>The Kiewit/PB Safety and Health Plan and training allows for confined spaces to be classified as either PRCSs or NPCSSs. However, the Kiewit/PB Industrial Hygiene Group has identified a third classification of confined spaces, namely Confined Spaces for Atmospheric Testing (CSAT). CSATs are confined spaces that meet OSHA criteria, but are associated with short-duration entries in which the work to be performed is the entry itself (e.g., for observations). A CSAT permit is used to document such entries. The CSAT permit is documented in the Industrial Hygiene Guideline (IHG-4) "Confined Space Air Monitoring" but appears neither in the Kiewit/PB Safety and Health Plan nor in the Kiewit/PB confined space training.</p>



**Table 5. Confined Space Entry (continued)**  
(C = Compliance, NC = Non-compliance, n/a = Not Applicable)

LOI 1E: A qualified person shall determine the need for periodic identification and re-evaluation of the hazards based on possible changes in the space or environs which could adversely effect the space. [ANSI Z117.1, Para 3.5]	C	Based on interviews, the Kiewit/PB Industrial Hygiene Manager appears to be knowledgeable of changing conditions in confined spaces which would require the need for a reevaluation of the confined space.
<b>Criterion 2: Non-Permit Confined Space [ANSI Z117.1, Para 4.0]</b>	n/a	
LOI 2A: The employer shall develop a written procedure which addresses specific measures and precautions which must be taken to safely enter an NPCS, including changes in conditions requiring a re-evaluation of the confined space [ANSI Z117.1, Para 4.1]	NC	Appendix 6, Section 4.2.5 and Exhibit 7.2 of the Kiewit Safety and Health Plan address the requirements for a Non-permit Space. <b>However, the Safety and Health Plan does not identify the conditions that would constitute a change in conditions which would require a reevaluation of the confined space.</b>
LOI 2B: Training. All employees who enter NPCS shall be trained in entry procedures and what conditions would prohibit entry.[ANSI Z117.1, Para 4.2]	C	The Kiewit/PB confined space training (Lesson Plan SH0010-0)adequately addresses procedures for PRCS and NPCS entries, yet does not address CSAT entries. Kiewit/PB training is based on ANSI Z117.1 and references it in the lesson plan (pg. 3 of 4).
LOI 2C: NPCS's shall be periodically re-evaluated to assure proper classification. [ANSI Z117.1, Para 4.3]	NC	<b>The Kiewit/PB Safety and Health Plan does not address reevaluation of NPCSs.</b>
LOI 2D: A qualified person shall conduct atmospheric testing. If levels are not within acceptable limits after implementation of engineering controls, the entry shall not proceed. [ANSI Z117.1, Para 4.4]	C	Observations of Kiewit/PB Industrial Hygiene personnel on CSAT entry into a water manhole on 1/9/97 indicated that atmospheric testing was performed in accordance with the Standard. Individuals performing the testing were verified to have been qualified via formal classroom testing.

**Table 5. Confined Space Entry (continued)**  
(C = Compliance, NC = Non-compliance, n/a = Not Applicable)

<b>Criterion 3: Permit Required Confined Spaces.</b>	n/a	Most confined spaces are NPCSS or CSATs. No entries into a PRCS have been made to date. However, a plan to enter all sewers (which are PRCSs) on an annual basis as of April 1, 1997, will increase the frequency of entry into PRCSs.
LOI 3A: Permits shall be established for all PRCS entries and include those items listed in this section of the Standard.[ANSI Z117.1, Para 5.1]	C	The Kiewit/PB Safety and Health Procedure conforms with this section of the ANSI Standard.
LOI 3B: Permit Implementation. [ANSI Z117.1, Para 5.2]	n/a	No entries into PRCSs have been made to date.
LOI 3C: Duration of Permits [ANSI Z117.1, Para 5.3]	NC	<b>The Kiewit/PB Safety and Health Plan does not address duration of permits or re-entry requirements as identified in the ANSI Standard.</b>  Kiewit/PB confined space training addresses several of the ANSI requirements not addressed in the Safety and Health Plan.
LOI 3D: Revoking Permits. When conditions or work activity are different than those specified on the permit and could introduce a new hazard, than the permit shall be revoked.[ANSI Z117.1, Para 5.4]	NC	<b>The Kiewit/PB Safety Health Plan does not address revoking permits as identified in the ANSI Standard.</b>
LOI 3E: Changing Work Conditions. A new permit shall be issued or the original permit re-issued when work conditions change or new hazards are introduced. [ANSI Z117.1, Para 5.5]	NC	<b>The Kiewit/PB Safety and Health Plan does not address reissuing permits for changing conditions as identified in the ANSI Standard.</b>
<b>Criterion 4: Atmospheric Testing [ANSI Z117.1, Para 6.0]</b>		

**Table 5. Confined Space Entry (continued)**  
(C = Compliance, NC = Non-compliance, n/a = Not Applicable)

LOI 4A: Requirements. Before entry into a confined space, testing shall be conducted for hazardous atmospheres by a qualified person.[ANSI Z117.1, Para 6.1]	C	Kiewit/PB procedure and practice require atmospheric testing of confined spaces prior to entry.
LOI 4B: Testing Considerations. Testing of confined spaces shall be conducted through the entire portion of the space to be occupied. [ANSI Z117.1, Para 6.2]	C	Kiewit/PB atmospheric testing observed on a CSAT space entry on 1/9/97 met this requirement.
LOI 4C: Acceptable Limits. The atmosphere of the confined spaces shall be within the acceptable limits of this Standard.[ANSI Z117.1, Para 6.3]	NC	<b>The lower explosive limit (LEL) of 20% identified on the Kiewit/PB CSAT form is inconsistent with the less than 10% of the LEL as required by the Standard.</b>
<b>Criterion 5: Attendants.[ANSI Z117.1, Para 7.0]</b>		
LOI 5A: Duties and requirements of the attendant(s) shall be as described in this section of the Standard.[ANSI Z117.1, Para 7.1 - 7.4]	C	Duties of the attendants as described in Section 4.5 of the Kiewit/PB procedure are consistent with the intent of the ANSI Standard.
<b>Criterion 6: Isolation and Lockout/Tagout (LOTO).</b> Duties and requirements for isolation and LOTO of all energy sources shall be as described in this section of the Standard. [ANSI Z117.1, Para 8.0]	NC	<b>LOTO is addressed as an example of physical hazard control in the Kiewit/PB Safety and Health Plan. However, the Plan lacks detail of LOTO precautions to the extent described in the ANSI Standard.</b> LOTO training is not required for confined space entry either by the Kiewit/PB Safety and Health Plan or the Kiewit/PB training for confined spaces.
<b>Criterion 7: Ventilation. Ventilation requirements shall be as described in this section of the Standard. [ANSI Z117.1, Para 9.0].</b>	C	Ventilation requirements are addressed in Section 4.2.4 of the Kiewit/PB Safety and Health Plan. The Plan sufficiently addresses the requirements of the ANSI Standard.

**Table 5. Confined Space Entry (continued)**  
(C = Compliance, NC = Non-compliance, n/a = Not Applicable)

<b>Criterion 8: Cleaning/Decontamination.</b> Cleaning and decontamination requirements shall be as described in this section of the Standard. [ANSI Z117.1, Para 10.0]	NC	<b>Cleaning and decontamination of confined spaces to the extent feasible prior to entry is not addressed in the Kiewit/PB Safety and Health Plan.</b>
<b>Criterion 9: Personal Protective Equipment (PPE) requirements</b> shall be as described in this section of the Standard. [ANSI Z117.1, Para 11.0].	NC	<b>PPE is not addressed in the text of the Kiewit/PB Safety and Health Plan, although provisions for specifying PPE are included in the Confined Space Entry Permit.</b> PPE is, however, addressed in the Kiewit/PB confined space training.
<b>Criterion 10: Safeguards (e.g. entry, exit, retrieval, and fall protection)</b> shall be as described in this section of the Standard. [ANSI Z117.1, Para 12.0].	n/a	This section of the Standard applies to PRCS safeguards, which were not evaluated since PRCS entries have not been made at the ESF.
<b>Criterion 11: Warning Signs and Symbols</b> shall be as described in this section of the Standard. [ANSI Z117.1, Para 13.0].	NC	<b>The Kiewit/PB labeling of confined spaces in ESF pad areas is inconsistent.</b> Water manholes have no postings or warnings. Sewer manholes are labeled "Danger Authorized Personnel Only". Electrical manholes are labeled - "Danger Permit Required Confined Space - Do Not Enter". Section 4.2.F of the Kiewit/PB Safety and Health Plan assigns line management the responsibility for posting of confined spaces.
<b>Criterion 12: Emergency Response.</b> A plan of action shall be written with provisions to conduct a timely rescue for individuals in a confined space should an emergency arise. Consideration should be given to methods of rescue, designation of rescue personnel, type and availability of rescue equipment, effective means to summon rescuers, and training and drill of the attendants.[ANSI Z117.1, Para 14.0].	NC	<b>None of the emergency response provisions of this section of the ANSI Standard are evident at the ESF pad for confined space entries.</b> Retrieval equipment is not provided for confined space entries at the ESF. Although confined space entries are currently CSAT entries (not PRCS entries), entries are into constricted manways, such that without retrieval equipment or retrieval plans it is not evident how an injured or unconscious entrant could be removed in a timely manner. Furthermore, neither training nor drills involving the attendant or rescue personnel were evident. Although Section 4.2.9 to the Kiewit/PB Safety and Health Plan addresses confined space rescues, the equipment specified in the plan (e.g. retrieval lines, life support equipment) is not readily available to Kiewit/PB Safety and Health staff at the location of the confined space. Based on field observations, the attendants are not trained to the Kiewit/PB confined space procedure.
<b>Criterion 13: Training.</b>		

**Table 5. Confined Space Entry (continued)**  
(C = Compliance, NC = Non-compliance, n/a = Not Applicable)

LOI 13A: All employees required to enter confined or enclosed spaces shall be instructed as to the nature of the hazards involved, the necessary precautions to be taken, and the use of protective and emergency equipment required. The employer shall comply with any specific regulations that apply to work in potentially dangerous areas. [29 CFR 1926.21 (6)(i)].	C	Confined space entries are presently conducted only by Kiewit/PB employees. All construction personnel receive an introduction to confined spaces through the construction safety training course. Entrants, attendants and supervisors receive (a)an initial four-hour classroom training in confined spaces; (b) initial CPR training and annual refresher training; and (c) initial first aid training and first aid refresher training every 3 years. The class room training addresses the elements of this requirement. Managers are required to read the Confined Space Appendix (Appendix 6) of the Kiewit/PB Safety and Health Plan.
LOI 13A: Personnel responsible for supervising, planning, entering or participating in confined space entry and rescue shall be adequately trained in their functional duties prior to any confined space entry. Training shall include the provisions as stated in this section of the Standard [ANSI Z117.1, Para 15.1].	NC	<b>M&amp;O planners and M&amp;O engineers who have indirect involvement with confined spaces either in the design stages or job planning through JSAs have not received confined space training.</b>  Kiewit/PB managers are required to read the Confined Space Appendix (Appendix 6) of the Kiewit/PB Safety and Health Plan.
LOI 13B: Training for atmospheric monitoring personnel shall include training in the proper use of atmospheric monitoring instruments.[ANSI Z117.1, Para 15.1].	C	Atmospheric monitoring personnel receive the same training as confined space entrants and are mentored by the Kiewit/PB Industrial Hygiene Manager in the use and calibration of instrumentation. The Kiewit/PB Industrial Hygiene Guideline IHG-4 "Confined Space Air Monitoring" provides additional instruction to IH personnel on confined space entries and atmospheric monitoring.
LOI 13C: Training for attendants shall include summoning rescue and the proper use of equipment used for communicating with entry and emergency/rescue personnel.[ANSI Z117.1, Para 15.3].	C	Procedures for summoning and communicating with rescue teams are addressed in the Kiewit/PB Confined Space Training (pg 18 of 24).

**Table 5. Confined Space Entry (continued)**  
(C = Compliance, NC = Non-compliance, n/a = Not Applicable)

LOI 13D: Training for emergency response personnel shall include rescue plan, procedures developed for each type of confined space they are anticipated to encounter, the use of emergency rescue equipment, first aid and CPR, work location and confined space configuration to minimize time. [ANSI Z117.1, Para 15.4].	NC	Although rescue workers are trained in first aid and CPR, <b>emergency response personnel are not trained in the different types of confined spaces and hazards they may encounter at the ESF pad.</b>
LOI 13E: Training sessions shall be repeated as often as necessary to maintain an acceptable level of personnel competence. [ANSI Z117.1, Para 15.5].	C	Recertification for confined space entry is required on an annual basis by the Kiewit/PB Training Department.
<b>Criterion 14: The physical and psychological suitability of persons to do confined space work shall be considered prior to working in confined spaces. [ANSI Z117.1, Para 16.0].</b>	n/a	The medical and psychological aspects of confined space entries were not evaluated.
<b>Criterion 17: Contractors. Employers who use contractors to enter confined spaces shall inform contractors of known potential hazards associated with the confined space to be entered, and the employer and contractor shall identify the rescue responder. [ANSI Z117.1, Para 17.0].</b>	n/a	Not evaluated since contractors are not used for confined space entries. However, according to Kiewit/PB, contractors may be used in place of Kiewit/PB personnel for sewer entries, which may commence as early as April 1, 1997.

**Table 5. Confined Space Entry (continued)**  
(C = Compliance, NC = Non-compliance, n/a = Not Applicable)

<p><b>Criterion 18:" Kiewit/PB supervision is responsible for ..enforcing the confined space procedures and permit requirements...ensuring that safety retrieval equipment for confined spaces is provided, is on-site, operational and properly deployed prior to entry,...ensuring that appropriate measures are implemented so that confined spaces will not be inadvertently entered (e.g. posting of confined spaces).."</b>  <b>[Section 4.2, Appendix 6, Kiewit/PB S&amp;H Plan]</b></p>	<p align="center">NC</p>	<p><b>Kiewit/PB line management and supervision have not assumed their responsibilities for confined space entries as defined in Section 4.2 of Appendix 6, of the Kiewit/PB Safety and Health Plan, especially with respect to safety retrieval equipment, posting of confined spaces and enforcing confined space procedures and permit requirements.</b></p>
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**YUCCA MOUNTAIN PROJECT  
INDUSTRIAL HYGIENE PROGRAM COMPLIANCE REVIEW**

**PROGRAM ELEMENT ASSESSED:**

Ergonomics

**REGULATORY BASIS:**

A review of the Kiewit/PB and M&O ergonomic programs was performed. However, since OSHA has yet to promulgate ergonomic standards, a review was performed against best practices with respect to the construction industry.

Revision 3 of the YMP Safety & Health Plan, Section 3.4.7 states that "although regulations currently do not exist for blunting this type of workplace exposure, DOE has endorsed the development and implementation of an ergonomic control program. A written ergonomics management program is required, if and when required by OSHA."

The LOIs in Table 6 address the five basic elements of an ergonomic program, namely (1) management commitment and employee involvement, (2) worksite analysis, (3) prevention and control, (4) medical management, and (5) training and education.

**PERSONNEL CONTACTED:**

Leroy Montgomery, M&O Industrial Hygiene Ergonomics Coordinator  
Mary Lou Brown, Kiewit/PB Training  
Mike Penovich, Paul Turner, Joel Karasik, M&O Training  
Mike Pochowski, Dan Chapman, M&O Industrial Hygiene  
Bill Burke, John Cole, YMSCO

**COMPLIANCE ASSESSMENT SUMMARY**

Both the Kiewit/PB and M&O ergonomics activities were reviewed. However, only the M&O has implemented an ergonomic program for its workers. Kiewit/PB's limited ergonomic activities consist of (1) inclusion of ergonomics in the "General Office Safety" training provided to all non-construction workers; and (2) monthly office walkthroughs conducted by representatives of the Kiewit/PB Safety and ES&H Training Groups.

The M&O has implemented an effective ergonomic program that mitigates "office ergonomic" hazards. However, the program is not documented and lacks procedures. M&O management has committed to the ergonomics program through the M&O Safety and Health Plan. Although the program has yet to be proceduralized, workstation ergonomic evaluations are thorough, systematic, and effective, according to employees. M&O ergonomic class room training should be expanded to address (1) the corporate commitment to ergonomics and YMP ergonomics program; (2) a discussion of ergonomic hazards at all YMP worksites (the present training is limited to office ergonomics); (3) all ergonomic disorders that might be encountered at YMP (not just carpal tunnel syndrome); and (4) a description of the Workplace Analysis Service offered by Industrial Hygiene, and how to obtain such service.



**YUCCA MOUNTAIN PROJECT  
INDUSTRIAL HYGIENE PROGRAM COMPLIANCE REVIEW (Continued)**

**OBSERVATIONS OF PROFICIENCIES AND DEFICIENCIES**

**Proficiencies**

The M&O Ergonomics Coordinator is committed to continual improvement of the M&O ergonomics program, and his diligence in resolving office workstation ergonomic concerns to employees' satisfaction is noteworthy.

**Non-compliances**

Since there is no regulatory basis for an ergonomics program, there are no regulatory non-compliances. The "non-compliances" listed in Table 6 are in support of the recommendations summarized below.

**Recommendations**

Kiewit/PB should implement an ergonomics program as appropriate to its ergonomic related activities. The ergonomics program should address (1) management commitment and employee involvement, (2) worksite analysis, (3) prevention and control, (4) medical management, and (5) training and education. (Criterion 1)

An ergonomic procedure or written program describing the ergonomics program, responsibilities, and workstation analysis should be issued by the M&O and Kiewit/PB, as appropriate. (LOI 1A, 1D)

The Kiewit/PB Safety and Health Plan (July 1996) should address ergonomics programs, responsibilities, and management commitment. (LOI 1B, 1C)

The M&O ergonomics program should be expanded beyond "office ergonomics," although "office ergonomics" is the predominant hazard for the M&O. (LOI 1D)

Since some M&O employees have expressed concern about possible management reprisal for identifying ergonomic workstation concerns, supervisors should inform employees of their commitment to the ergonomics program and that requests for ergonomic assistance will not reflect adversely on their job security. (LOI 1E)

Procedures and/or mechanisms (e.g., ES&H compliance reviews) should be implemented to evaluate the implementation of the ergonomics program and monitor progress. (LOI 1F)

M&O classroom training in ergonomics should be expanded to address (1) the corporate commitment to ergonomics and the YMP ergonomics program; (2) a discussion of ergonomic hazards at all YMP worksites (the present training is limited to office ergonomics); (3) all ergonomic disorders that might be encountered at YMP (not just carpal tunnel syndrome), and (4) a description of the Workplace Analysis Service offered by Industrial Hygiene, and how to obtain such service. (LOI 5A, 5C)

The M&O "Safety and Health Training for M&O Supervisors" should address management responsibilities for implementation of the M&O ergonomics program. (LOI 5D)

Lines of Inquiry	Status	Comment
<b>Criterion 1: Management Commitment and Employee Involvement. Commitment by management provides the organizational resources and motivating force necessary to deal effectively with ergonomic hazards</b>	NC	<b>The M&amp;O has implemented an ergonomics program for its workers; Kiewit/PB has not.</b> Kiewit/PB ergonomic activities consist of (1) inclusion of ergonomics in the "General Office Safety" training provided to all non-construction workers; and (2) monthly office walkthroughs conducted by representatives of the Kiewit/PB Safety and ES&H Training Groups. Ergonomics is not addressed in the "Contractor Safety" training provided to Kiewit/PB construction workers. This assessment principally addresses the M&O ergonomics program.
LOI 1A: Employee involvement and feedback through clearly established procedures are essential to identify existing and potential ergonomic hazards and to develop and implement an effective way to abate such hazards.	NC	<b>An ergonomic procedure describing the ergonomics program, responsibilities, and workstation analysis has not been issued by the M&amp;O.</b> A procedure was drafted in 1994, but was not issued. Ergonomics activities are minimally addressed in the M&O Industrial Hygiene Field Plan.  Employee awareness of the M&O ergonomic program is being achieved through (1) the M&O "Safety and Health Training for Site M&O Personnel" (3/16/94); and (2) ergonomic referrals to the Industrial Hygiene Group from employees and M&O managers.
LOI 1B: The employer recognizes that the implementation of an effective ergonomics program requires a commitment to provide visible involvement of top management.	NC	<b>The Kiewit/PB Safety and Health Plan (July 1996) does not address ergonomics programs or responsibilities.</b>  Safety and Health Manuals establish safety and health policy at a top management level. Section 3.2.6 of the M&O Safety and Health Plan (12/11/96) addresses the M&O's ergonomics program and assigns responsibility to line management for program implementation, with assistance from the M&O Safety and Health staff as requested.
LOI 1C: Each manager, supervisor, and employee responsible for the ergonomics program in the workplace is accountable for carrying out their responsibilities	NC	See previous LOI.
LOI 1D: A written program is established, communicated to all personnel, encompasses the total workplace, and establishes clear goals and objectives.	NC	<b>A written ergonomics program has not been issued by either the M&amp;O or the construction subcontractor.</b> Communication of ergonomics hazards and workplace analyses services are communicated by the M&O via training, the Ergonomic Coordinator and word of mouth. The existing M&O ergonomics program is limited to "office ergonomics."

LOI 1E: The ergonomics program includes a commitment to provide for and encourage employee involvement in the ergonomics program.	C	Employee involvement in the M&O ergonomics program is evident through frequent employee interaction with the Ergonomics Coordinator, and employee feedback following a workstation analysis. However, based on observations from the M&O Ergonomics Coordinator, some employees are reluctant to request ergonomic assistance for fear of management reprisals.
LOI 1F: Procedures and mechanisms have been developed to evaluate the implementation of the ergonomics program and to monitor progress accomplished.	NC	<p><b>It is not evident that the M&amp;O ergonomics program has been evaluated for effectiveness, although memos from employees attest to their satisfaction with ergonomic services rendered. Reviews of the M&amp;O ergonomics program have not been performed nor are such reviews scheduled to be performed by external assessment organizations (e.g., ES&amp;H Compliance Group).</b></p> <p>An "Ergonomic Evaluation Customer Survey" is provided by the M&amp;O Ergonomic Coordinator to each employee who has requested a workstation analysis. The customer survey allows for feedback on the ergonomic evaluation to the Ergonomic Coordinator.</p>
<b>Criterion 2: Worksite Analysis. A step-by-step review of the workplace to identify hazards leading to cumulative trauma disorders (CTDs) if the first step in implementing an effective ergonomic program.</b>		
LOI 2A: A worksite analysis has been conducted to identify ergonomic hazards and working conditions that produce CTDs wherever they may exist, operations that create such hazards, and areas where such hazards may develop.	C	Although the M&O has not reviewed all worksites for ergonomic hazards, a significant number of office workstations, warehouse facilities, etc., have been evaluated by the Ergonomics Coordinator.
LOI 2B: The workshop analysis uses a systematic method to identify those work positions needing a quantitative analysis of ergonomic hazards.	C	The workshop analysis, although not proceduralized, consists of a systematic, detailed "Ergonomics Job Evaluation Form" prepared by both the employee and the Ergonomics Coordinator. Analysis is performed at the request of the employee, their supervisor, or group managers. The number of ergonomic assistance calls averaged four to five calls per month in 1996, but has increased considerably in 1997. Only 20% of one full-time equivalent staff is available for administering the M&O ergonomics program.
LOI 2C: Periodic surveys of the worksite are conducted - at least annually, or whenever there are significant operational changes - in order to identify new or previously unnoticed risk factors, and to assess the effects of changes in the work process.	C	Periodic surveys are performed by both the M&O and the construction subcontractor through monthly safety team facility walkthroughs.

**Table 6. Ergonomics (continued)**  
(C = Compliance, NC = Non-compliance, n/a = Not Applicable)

LOI 2D: The worksite analysis includes a system for employees to notify management about conditions that appear to constitute ergonomic hazards and to utilize their insight in order to determine appropriate work practice and engineering controls.	C	The "Ergonomic Job Evaluation" is performed primarily by the employee. Supervisors are typically informed of the results of the evaluation.
<b>Criterion 3: Prevention and Control. In the event that ergonomic hazards are identified through the worksite analysis, measures have been designed to prevent or control these hazards, through effective design of the workstation, tools and job.</b>	n/a	
LOI 3A: Engineering techniques are the preferred method of control to make the "job fit the person". Workstations, work methods, and tools have been designed or modified to eliminate excessive exertion and awkward postures, and to reduce repetitive motion when such is feasible and useful.	C	The M&O Ergonomics Coordinator has provided assistance is redesigning workstations to abate ergonomic concerns. Footrests, back supports, etc., have been provided by management as needed.
LOI 3B: The employer's program for hazard prevention and control includes procedures for safe and proper work that are understood and followed by managers, supervisors and workers.	NC	<b>The present M&amp;O ergonomic program is primarily reactive, based on employee complaints and not on prevention.</b>  Recently M&O managers have requested the assistance of the Ergonomics Coordinator for new hire orientations and pending office moves.
<b>Criterion 4: Medical Management. A proper medical management is necessary in order to eliminate or materially reduce the risk of CTD signs and symptoms through early identification and treatment, and to prevent future problems through the development of information sources.</b>	n/a	This criterion was not evaluated.
<b>Criterion 5: Training and Education. Training and education of those employees potentially exposed to ergonomics hazards is a critical component of an ergonomics program.</b>		

**Table 6. Ergonomics (continued)**  
(C = Compliance, NC = Non-compliance, n/a = Not Applicable)

LOI 5A: The following individuals should be included in a training and education program - all affected employees, engineers and maintenance personnel, supervisors, managers, and health care providers.	C	<p>M&amp;O ergonomics training is provided to all employees through the "Safety and Health Training for M&amp;O Personnel." This 1.5 hour block of formal classroom training addresses office ergonomics. The office ergonomics section of the training addresses nine recommended steps while working at a computer, and informs students of ergonomic related injuries (e.g., carpal tunnel syndrome). A video on computer ergonomics is referenced, but not incorporated into the training session.</p> <p>Although some ergonomic training is provided to all employees, the training could be strengthened by (1) describing the corporate commitment to ergonomics and YMP ergonomics program; (2) expanding the discussion of ergonomics from only office safety to warehousing operations, job site activities, etc.; (3) including a discussion of all ergonomic disorders that might be encountered at YMP (not just carpal tunnel syndrome); and (4) describing the Workplace Analysis Service offered by Industrial Hygiene, and how to obtain such service.</p>
LOI 5B: The ergonomics program will be presented in a language and at a level of understanding that is appropriate for the individuals being trained.	C	The M&O ergonomics program is presented though (1) classroom training; (2) direct mailing of standard industrial ergonomics booklets to employees, e.g., "Arranging Your Work Station to Fit You," "Exercises at Your Workstation," "Carpal Tunnel Syndrome"; (3) ergonomic information provided to employees via the computer "Lotus Notes"; and (4) individual meetings with the M&O Ergonomics Coordinator. In each of these media, the ergonomic material was presented at a level that could be easily understood.
LOI 5C: The ergonomics program will include a means for adequately evaluating its effectiveness (e.g. employee interviews, testing, observing work practices, etc.)	C	An "Ergonomic Evaluation Customer Survey" is provided by the M&O Ergonomic Coordinator to each employee who has requested a workstation analysis. The customer survey allows for feedback on the ergonomic evaluation to the Ergonomic Coordinator.
LOI 5D: Training of affected employees will consist of both general and job-specific training.	C	Both general and job-specific training are provided by the M&O, but this is limited to "office ergonomics." Office ergonomics, however, is the predominant ergonomic issue for the M&O.

**Table 6. Ergonomics (continued)**  
(C = Compliance, NC = Non-compliance, n/a = Not Applicable)

LOI 5D: Sufficient training and instruction in ergonomics is provided to supervisors and managers.	NC	<b>The M&amp;O "Safety and Health Training for M&amp;O Supervisors" does not address management responsibilities for implementation of the M&amp;O ergonomics program.</b> The M&O Supervisor's Safety and Health Manual does address supervisor responsibilities and contacts for the ergonomics program.
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**YUCCA MOUNTAIN PROJECT  
INDUSTRIAL HYGIENE PROGRAM COMPLIANCE REVIEW**

**PROGRAM ELEMENT ASSESSED:**

Recordkeeping

**REGULATORY BASIS:** 29 CFR 1904: Recording and Reporting Occupational Injuries and Illnesses; Office of Management and Budget (OMB) No. 1220-0029: Recordkeeping Guidelines for Occupational Injuries and Illnesses (The "Blue Book")

**PERSONNEL CONTACTED:**

John Bull, Kiewit/PB, Safety Manager

**COMPLIANCE ASSESSMENT SUMMARY**

A regulatory compliance assessment of Kiewit/PB Recordkeeping activities for ESF tunnel and pad operations was conducted.

Kiewit/PB maintains all OSHA-required records and sends Computerized Accident and Incident Reporting System (CAIRS) reports directly to DOE as required. Instances of recordability determinations did not agree with OSHA guidance.

**OBSERVATIONS OF PROFICIENCIES AND DEFICIENCIES**

**Proficiencies**

The program manager is experienced and knowledgeable. Records are complete and up to date.

**Non-compliances**

Determinations of recordability of some injuries do not follow the interpretations given by OSHA. This causes some recordable injuries to be missed in the OSHA log and supplementary record.

**Observations**

The Kiewit/PB recordkeeping program should benefit from closer contact with OSHA on recent developments and interpretations in recordability determinations. This contact should be supported through occupational safety and health staff support.

**Table 7. Recordkeeping**  
(NC = Non-compliance, C = Compliance, NA = Not Applicable)

Lines of Inquiry	Status	Comment
<b>Criterion 1. Log and Summary of Occupational Injuries and Illnesses.</b>		
LOI 1a: A log and summary of all recordable occupational injuries and illnesses is maintained. [29 CFR 1904.2(a)(1)]	C	Kiewit/PB maintains a log of recordable injuries and illnesses that is readily available.
LOI 1b: Each recordable injury or illness is entered on the log and summary within 6 working days after receipt of notice of occurrence. [29 CFR 1904.2(a)(2)]	C	Entries were made with six days of notification of the injury (no illnesses were recorded in the past year).
LOI 1c: The log and summary conform to OSHA Form 200 format. [29 CFR 1904.2(a)]	C	The forms used for the log and summary are a computerized version of the OSHA 200 Form.
<b>Criterion 2. Supplementary Record.</b>  A supplementary record for each recordable occupational injury and illness, containing the information required on OSHA Form 101 is maintained. [29 CFR 1904.4]	C	Supplementary records for each recordable injury are kept with the individual's case file. These records, Form C-3, contain all the information required on OSHA Form 101. Of the C-3 Forms reviewed, all had all information blocks completed. This information is also submitted quarterly by Kiewit/PB directly to the DOE CAIRS database system.
<b>Criterion 3. Annual Summary</b>		
LOI 3a: An annual summary of occupational injuries and illnesses consisting of the totals of the OSHA 200 log is posted Feb. 1 following the calendar year covered. [29 CFR 1904.5(c)]	C	According to an interview, annual summaries are posted are required by OSHA.
LOI 3b: The annual summary is certified to be true and complete. [29 CFR 1904.5(c)]	C	According to an interview, annual summaries are signed and certified by the Kiewit/PB Safety Manager.
<b>Criterion 4. Retention of records.</b>  Log and summary and supplementary records are maintained for 5 years. [29 CFR 1904.6]	NA	Not evaluated.



**Table 7. Recordkeeping (continued)**  
(NC = Non-compliance, C = Compliance, NA = Not Applicable)

<p><b>Criterion 5. Access to Records.</b></p> <p>The log and summary are made available to employees and their representatives. [29 CFR 1904.7(b)(1)]</p>	<p>NA</p>	<p>Not evaluated.</p>
<p><b>Criterion 6. Definitions.</b></p> <p>In determining the recordability of an occupational injury or illness, the definitions in 29 CFR 1904.12(b) through (g), and the guidance contained in O.M.B. 1220-0029 - <u>Recordkeeping Guidelines for Occupational Injuries and Illnesses</u> is adhered to.</p>	<p>NC</p>	<p>Four first aid cases, previously determined to be non-recordable, were reviewed. <b>Three of these cases were recordable, according to OSHA guidance.</b></p> <p>Without going into the detail of the specific cases, three areas of disagreement appear on page 43 of the OMB reference:</p> <ul style="list-style-type: none"> <li>- <u>Any</u> use of a wound-closure aid (butterfly dressings, steri-strips) is recordable. This is a change in OSHA policy.</li> <li>- Removal of a foreign body from a wound, if complicated by the <u>location</u> of embedment, is recordable.</li> <li>- Restriction of work or motion that impairs an employee's <u>ability</u> to perform <u>all or any part of</u> their normal assignment during <u>all or any part of</u> the workday is recordable.</li> </ul>

**YUCCA MOUNTAIN PROJECT  
INDUSTRIAL HYGIENE PROGRAM COMPLIANCE REVIEW**

**PROGRAM ELEMENT ASSESSED:**

Indoor Air Quality (IAQ)/ Smoking Policy

**REGULATORY BASIS:**

Since OSHA has yet to promulgate Indoor Air Quality (IAQ) standards, this review was performed against the draft OSHA IAQ Standards published in the Federal Register on April 5, 1994.

Section 3.3.4.8 of Rev. 3 of the YMP Safety & Health Plan addresses a no smoking policy for DOE facilities, yet does not provide guidance with respect to an overall IAQ program.

**PERSONNEL CONTACTED:**

Mary Lou Brown, Kiewit/PB Training  
Mike Penovich, Paul Turner, Joel Karasik, M&O Training  
Mike Pochowski, Dan Chapman, M&O Industrial Hygiene  
Barry McNeil, Kiewit/PB Industrial Hygiene  
Bill Burke, John Cole, YMSCO

**COMPLIANCE ASSESSMENT SUMMARY**

Both the Kiewit/PB and M&O indoor air quality (IAQ) programs and activities were reviewed. Only the M&O has implemented an IAQ program for its office and warehouse workers, and a no smoking policy is described in the organization's Safety and Health Plan. The M&O IAQ program has both proactive and reactive elements. The proactive element consists of IAQ surveys of new buildings or remodeling activities for noxious gas which may be emitted from new furnishings, or combustion. The reactive element is to respond to employee complaints of illness symptomatic of "sick building syndrome."

The M&O IAQ program is effective, although not well documented. IAQ demands are infrequent, and the M&O Industrial Hygiene Group has been responsive to those demands. To date, IAQ surveys have been performed by the M&O in support of two moves at the Summerlin facility, diagnosis of gas odors emanating from the Bank of America complex in 1994, and a limited number of responses based on employee complaints.

Although implementation of an extensive IAQ program is not suggested by this review for either the M&O or the construction contractor (Kiewit/PB), a minimal IAQ program consisting of IAQ employee awareness training, routine surveillances of buildings for IAQ problems, response and diagnostic capability to address employee concerns, and recordkeeping with respect to employee complaints is recommended. Table 8 provides suggestions as to the content of a typical IAQ program. However, since the office buildings occupied by the M&O and Kiewit/PB are leased, any IAQ program would require an interface with the building owner, who is responsible for building and heating, ventilation, and air conditioning (HVAC) system maintenance and operation.

## **OBSERVATIONS OF PROFICIENCIES AND DEFICIENCIES**

### **Proficiencies**

The M&O Industrial Hygiene Group has initiated the foundations of an effective IAQ program to minimize worker illnesses and discomfort in office buildings, although such a program is not required by DOE orders, OSHA regulations, or the YMP Safety and Health Plan.

### **Non-compliances**

Since there is no regulatory basis for an IAQ program, there are no regulatory non-compliances. The "non-compliances" listed in Table 8 are in support of the recommendations summarized below.

### **Recommendations**

The M&O IAQ program should be sufficiently documented to define both the elements and the activities of the program. (Criterion 1)

Although implementation of an extensive IAQ program is not suggested by this review for either the M&O or the construction subcontractor (Kiewit/PB), a minimal IAQ program consisting of IAQ employee awareness training, routine surveillances of buildings for IAQ problems, response and diagnostic capability to address employee IAQ concerns, and recordkeeping is suggested. (LOI 1B, 5A, 5B, 5C, 6C)

The M&O "Structured Surveillance Schedule" program could easily be expanded to incorporate IAQ checklist items. (LOI 2B)

A no-smoking policy for Kiewit/PB's controlled office spaces and warehouses should be addressed in the Kiewit/PB Safety and Health Plan (July 1996) and other safety and health documents (e.g. Employee Safety Handbook), as applicable. (LOI 3A)

**Table 8. Indoor Air Quality/Smoking Policy**  
(C = Compliance, NC = Non-compliance, n/a = Not Applicable)

Lines of Inquiry	Status	Comment
<b>Criterion 1: Indoor Air Quality (IAQ) Compliance Program. All employers covered by this section shall establish a written IAQ compliance program. [1910.1033 (c)(1)]</b>	NC	<b>The M&amp;O IAQ program description is marginal and limited to a paragraph description of air requirements provided in Section 1.7 of the Industrial Hygiene Manual. Rev. 2 of the M&amp;O Safety and Health Plan does not address IAQ.</b>  <b>Kiewit/PB has not defined or implemented an IAQ program.</b>
LOI 1A: The employer shall identify a designated person who is given responsibility to assure implementation of the IAQ program. [1910.1033 (c)(2)]	C	Although an individual has not been designated, the M&O Industrial Hygiene Group typically receives employee concerns about IAQ issues, although employees have not been instructed to this end.
LOI 1B: Written plan for compliance shall include: written description of the facility building systems, single-line schematics or as-builts, information of the daily operation and management of the building systems, a general description of the building and its function, a written maintenance program for the maintenance of the building. [1910.1033 (c)(3)]	NC	While a written plan for the M&O IAQ need not include all of the elements listed in this LOI, <b>a minimal plan or guideline should describe the M&amp;O IAQ activities, procedures, and recordkeeping so that any individual within the M&amp;O Industrial Hygiene Group could respond to an IAQ inquiry.</b>
<b>Criterion 2: Compliance Program Implementation: Employers shall assure compliance by implementing at least the following:</b>		
LOI 2A: Maintain and operate the HVAC system to assure that it operates up to original design specifications and continues to provide at least the minimum outside air ventilation rate. [1910.1033 (d)(1)]	n/a	Maintenance and operation of the HVAC system is a responsibility of the office building owners, Howard Hughes Corporation and the Bank of America.
LOI 2B: Conduct building systems inspections and maintenance. [1910.1033 (d)(2)]	C	The M&O currently conducts quarterly office building inspections through the "Structured Surveillance Schedule." This program could easily be expanded to incorporate IAQ checklist items.

**Table 8. Indoor Air Quality/Smoking Policy (continued)**  
(C = Compliance, NC = Non-compliance, n/a = Not Applicable)

LOI 2C: Assure that the HVAC system is operating during all work shifts, except during emergency HVAC repairs and scheduled maintenance. [1910.1033 (d)(3)]	n/a	See LOI 2A.
LOI 2D: Implement the use of local exhaust ventilation where house keeping and maintenance activities involve use of equipment or products that could reasonably be expected to result in hazardous chemical or particulate exposures to employees working in other areas of the building or facility. [1910.1033 (d)(4)]	n/a	See LOI 2A.
LOI 2E: Maintain relative humidity below 60% in buildings with mechanical cooling systems. [1910.1033 (d)(5)]	n/a	See LOI 2A.
LOI 2F: Monitor carbon dioxide levels. [1910.1033 (d)(6)]	C	CO levels are monitored by the M&O Industrial Hygiene Group upon request or in support of IAQ investigations.
LOI 2G: Assure that buildings without mechanical ventilation are maintained. [1910.1033 (d)(7)]	n/a	See LOI 2A.
LOI 2H: Assure that inspections and maintenance of building systems are performed under the supervision of the designated person [1910.1033 (d)(8)]	C	See LOI 2B.
LOI 2I: Establish a written record of building system inspections and maintenance. [1910.1033 (d)(9)]	n/a	See LOI 2A.

**Table 8. Indoor Air Quality/Smoking Policy (continued)**  
(C = Compliance, NC = Non-compliance, n/a = Not Applicable)

LOI 2J: Assure that employees performing work on building systems are provided with appropriate PPE. [1910.1033 (d)(10)]	n/a	See LOI 2A.
<b>Criterion 3: Controls for specific contaminant sources (i.e. tobacco, microbial contamination and other indoor contaminants)</b>	n/a	
LOI 3A: Tobacco smoke. In work places where the smoking of tobacco products is not prohibited, the employer shall establish designated smoking areas and permit smoking only in such areas. Designated smoking areas shall comply with the provisions of this section. [1910.1033 (e)(1)]	NC	<p><b>A smoking policy is not addressed in Rev. 1 of the Kiewit/PB Safety and Health Plan issued in July 1996, or other Kiewit/PB safety and health documents.</b></p> <p>Section 3.3.4.8 of the YMP Safety and Health Plan addresses the DOE no-smoking policy for YMP. The Safety and Health Plan states that "a comprehensive smoking policy which prohibits smoking in government facilities (other than in designated areas) and vehicles is required." The smoking policy is incorporated into Section 3.3 of the M&amp;O Safety and Health Plan (12/11/96) and quarterly building inspections record whether smoking has been observed in facilities.</p>
LOI 3B: Other indoor contaminants. The employer shall implement measures such as relocation of air intakes to restrict the entry of outdoor air contaminants, such as vehicle exhaust fumes, into the building/. [1910.1033 (e)(2)]	C	The M&O has provided assistance in isolating vehicle operations from an air intake at the Bank of America Building.
LOI 3C: Microbial contamination. The employer shall control microbial contamination in the building as indicated in this section of the standard. [1910.1033 (e)(3)].	n/a	Since HVAC systems are generally dry systems and any condensation would evaporate quickly, this is not deemed to be a concern.
<b>Criterion 4: Air Quality During Renovation and Remodeling</b>	n/a	

**Table 8. Indoor Air Quality/Smoking Policy (continued)**  
(C = Compliance, NC = Non-compliance, n/a = Not Applicable)

LOI 4A: During renovation or remodeling, the employer shall assure that work practices and controls are utilized to minimize the degradation of IAQ. [1910.1033 (f)(1)]	C	During recent Bank of America Building renovations, the M&O Industrial Hygiene Group has worked with the building owner in scheduling renovation activities during off-shift hours and has notified employees accordingly.
LOI 4B: Before remodeling or renovating, the contractor performing the work shall develop and implement a work plan to minimize entry of air contaminants. [1910.1033 (f)(2)]	n/a	This is a responsibility of the building owner.
LOI 4C: The employer shall notify employees in advance of work to be performed in the building. [1910.1033 (f)(3)]	C	See LOI 4A.
<b>Criterion 5: Employee information and training. [1910.1033 (g)]</b>	n/a	
LOI 5A: The employer shall provide training for maintenance workers and workers involved in building system operation and maintenance. [1910.1033 (g)(1)]	NC	<b>IAQ training is not provided by either the M&amp;O or the construction subcontractor.</b>
LOI 5B: All employees shall be informed of the contents of the IAQ standard, and signs and symptoms associated with building related illnesses. [1910.1033 (g)(2)]	NC	See LOI 5A.
LOI 5C: The employer shall make training materials available for inspection and copying by employees. [1910.1033 (g)(3)]	NC	See LOI 5A.
<b>Criterion 6: Recordkeeping [1910.1033 (h)]</b>	n/a	

**Table 8. Indoor Air Quality/Smoking Policy (continued)**  
(C = Compliance, NC = Non-compliance, n/a = Not Applicable)

LOI 6A: The employer shall maintain inspection and maintenance records. [1910.1033 (h)(1)]	n/a	This is a responsibility of the building owner.
LOI 6B: The employer shall maintain the written compliance program and plan. [1910.1033 (h)(2)]	n/a	A written program or plan does not currently exist for either the M&O or construction subcontractor.
LOI 6C: The employer shall maintain a record of employee complaints of signs or symptoms that may be associated with building-related-illnesses. [1910.1033 (h)(3)]	NC	The M&O responds to IAQ-related complaints via interoffice memoranda, which are tracked in the "Secretaries Correspondence Log." <b>However, provisions for tracking IAQ complaints are not recognized as a safety and health recordkeeping function per Section 1.10 of the M&amp;O Safety and Health Plan.</b>
LOI 6D: The employer shall retain records required to be maintained for at least three years, and required records shall be available on request to employees. [1910.1033 (h)(4)]	NC	See LOI 6C.